The Chemical Age

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The Consultant and Plant Construction

A FORTNIGHT ago we indicated the limitations of the scope for consultants in chemical engineering. Whilst these limitations are putting the brake upon the scope for consultants in certain directions, they are not yet fully operative, and well-established consultants in chemical engineering will be likely to find their services in demand in certain directions for many years to come. In some industries the consultant has virtually disappeared; in others he is as much sought after as ever. The spread of knowledge and the increasing legions of trained men turned out by the Universities must reduce the scope for the consultant as time passes, for only an exceptional man can keep himself so far above the general level that he will be an acknowledged master to whom his fellows will willingly pay large sums of money for advice upon subjects in which they themselves are qualified by knowledge, though perhaps not by judgment, to take their own decisions.

A principal scope for the consultant will lie in dealing with those difficult cases in which he is able to bring special knowledge to bear upon problems with which there is in the firm that avails itself of his services, no one qualified to deal, or in which the problems arise so occasionally that it does not pay to engage a whole-time man with the necessary experience. One such outlet for consulting work is in relation to plant construction. If the chemical plant manufacturers were logically organised so that each firm in the industry laid itself out to make and to be expert upon certain defined lines of plant, primarily subdivided in accordance with unit operations, and did not attempt to make lines with which the staff was not familiar, the consultant would not be needed. Chemical plant makers are, however, frequently, and of necessity, engaged in constructional work of wide variety and for many industries; in these circumstances the tendency will be to " have a shot at " anything suitable with the intention of developing it as a regular line if circumstances warrant that step. Initially, therefore, the tendency will be to find someone able to advise and to assist in building up specifications. If there is a chemical engineer engaged at the works, he may be able to do so, but frequently there is no one with that special experience and knowledge. In these circumstances the consultant is asked to step in.

This problem of the engegement of consultants to undertake such work for plant constructors is difficult —though it need not be so if properly handled. Consultants have declared to us that they have not been given a fair deal in instances where they have helped, and others have said that gambling on the lines on which they are so frequently asked to work should not be permitted. What frequently happens is that the consultant is asked to prepare designs and to give such other information as may be necessary on the understanding that he is reserved a proportion of the price obtained *should the order be secured*. The orders that follow from tenders of all types are probably not higher than 10 to 15 per cent.—frequently less. The orders that follow from tenders of the type just mentioned are probably less than 10 per cent. In effect the consultant acts as an unpaid member of the staff and may receive approximately a salesman's commission if his work bears fruit. The plant manufacturer cannot afford to pay full consultants' fees for preparing estimates, but far less can the consultant, whose opportunities of earning are rigidly circumscribed by the time at his disposal, afford to work for nothing. Chemical engineers who are not engaged as whole-time consultants can afford to undertake work of this character for in their case it probably means only giving up a certain amount of leisure time, and men engaged in teaching may sometimes be able to make use of the problems they are called upon to solve by giving them to the students. A number of men will not object to taking on speculative work of this character and may be justified in doing so. The *sine quâ non* is that a man who has helped the firm to develop a new line of business should reap the reward for his work by having a commission reserved for him on every order for that plant for a given period, perhaps ten years, whether he has been called upon to help in the preparation of any given tender or not. The gamble is taken as much by the external adviser as by the firm and both should share in the proceeds, if any.

The whole-time consultant, however, cannot be expected to work on these lines unless his time is insufficiently employed by his regular consulting work. The only equitable method of employing a consultant upon such work is for the firm to give him a retaining fee to cover a specified number of inquiries per year, and in addition to reserve a smaller commission fee from any orders obtained. If the retainer charged be compared with, for example, the wages that would be paid to a draughtsman or an engineer it will be recognised that the transaction carries no financial embarrassment to a firm that is genuinely anxious to engage in a new line of business.

When all this has been said, however, there is no doubt that the correct procedure is for a firm to investigate closely the possibilities of new lines, to engage staff capable of handling that business fully, and to go out wholeheartedly to capture a share of the market. If the market is not large enough to warrant that procedure, neither is it large enough to interest a consultant.

Notes and Comments

Ready for Emergencies

WE are not among those who attach undue weight to gossip about the inevitability of war, and we doubt the wisdom of giving prominence to the pronouncement in Dr. Herbert Levinstein's presidential address to the Institution of Chemical Engineers that war involving the principal European powers may come at any moment. The sensational Press seized upon it as good " copy," but scarcely did justice to Dr. Levinstein's statesmanlike review of the relationship of the chemical industry to the European outlook. The 1914 war caught the British chemical industry wholly unprepared, in contrast to the highly organised industry in Germany, upon which we had been depending largely for our peace-time chemical requirements. Board of Trade statistics show that we still buy large quantities of chemicals from abroad, but within the chemical industry there has been a gradual realisation of the need for organisation and we are not now so unprepared as may sometimes be thought. The chemical industry is stronger in every branch, more compact in structure, more compact in scope, and has large units ably directed. It is, in Dr. Levinstein's opinion the most up-to-date and best organised industry in this country. Such a state of affairs is one of the best possible guarantees against war, and for that reason we regard Dr. Levinstein's discourse not as a piece of alarmist propaganda, but as a welcome reassurance that the outlook is not so ominous as it might have been if the chemical industry did not stand where it does to-day.

Chemists and Employment

HOW far should the Institute of Chemistry intervene in matters relating to appointments for chemists? The question is almost as old as the Institute itself, and as no two appointments are exactly alike it has never been possible to lay down hard and fast rules. Generally speaking, however, the Institute holds that it should not intervene officially in any question concerning relations between a chemist and a private employer or an industrial concern, except where the public interest might be involved. It was stated at the annual meeting on Monday that the executive officers had been authorised to give general advice to members on such matters and to use their discretion as to whether questions concerning public appointments should be brought before the appointments committee. The Institute, as far as possible, discourages local authorities from offering professional chemical work to tender, and the executive officers have been asked to bring to the notice of the appointments committee cases in which it is alleged that routine work is being undertaken for local authorities by State-aided institutions, or the analysis of routine samples, or consulting work, as distinct from research work, is alleged to be undertaken by such institutions except in those cases where the institutions are known to maintain the only laboratories adequately equipped to carry out the work. Less than $1\frac{1}{2}$ per cent. of the members of the Institute are known to be out of work at the present time. If the re-armament programme is carried out in its entirety it is highly probable that the proportion will remain as low, if not lower, for some time to come.

Up-to-date Laboratories

COVERING approximately a quarter of an acre, the new laboratories which Professor F. G. Donnan opened at the works of B. Laporte, Ltd., at Luton, last week, represent the last word in works laboratory planning and equipment. They contrast sharply with the dark, dingy room which did duty as a laboratory nineteen years ago when the present chief chemist first joined the company and they will long remain a token of the company's recognition of the supreme importance of adequate facilities not only for testing raw materials and finished products, but for conducting original research and introducing new discoveries. All too often we are apt to lose sight of the connection between the university and the industrial laboratory, but the close connection between the two was emphasised at Luton when Professor Donnan bestowed his professorial blessing upon Mr. Weber, director and chief chemist, the man mainly responsible for the new laboratories—an old student of the Professor who had " made good " in every sense of the term. In many ways the Laporte laboratories reflect the standards of perfection aimed at in the University of London. Mr. Weber is doubly fortunate in having studied under Professor Donnan and in being associated with a company that appreciates the value of up-to-date laboratories. It is natural that a large chemical manufacturing company should lead the way; unfortunately there are still too many that are content to put up with laboratories of the " dark, dingy room " variety.

Increased Chemical Production

INDUSTRIAL activity in the United Kingdom in 1936, as estimated from particulars furnished from various sources to the Board of Trade, was 9.7 per cent. greater than in 1935, the index numbers for the two years (based upon 1930 = 100) being 124.5 and 113.5 respectively. The chemical industry participated in the general improvement, the index number for 1936 being 114.3 against 110.6 for 1935, showing an increase of $3\frac{1}{2}$ per cent. over the whole year. The volume of industrial production in each quarter of 1936 increased at about the same rate as compared with a year earlier. There is normally an appreciable reduction in activity in the third quarter, but production in the manufacturing industries in that quarter of 1936 was nearly equal to that of the second quarter, and in the case of chemicals and oils was 2.9 per cent. above the corresponding period of 1935. The index numbers for the December quarter of 1936, both for manufacturing industries and for all groups, represent the greatest volume of production in any quarter for which information is available. With the exception of engineering and shipbuilding (9 per cent.) the greatest increase in the last quarter over the September quarter was achieved by the chemical and oil group, which jumped from 110.6 to 119.2. Other noteworthy increases were:—Textiles (6 per cent.); non-ferrous metals (6 per cent.); food, drink and tobacco (5 per cent.); and iron and steel ($4\frac{1}{2}$ per cent.). The output of coal increased by $10\frac{1}{2}$ per cent. As compared with the corresponding quarter of 1935, there was marked expansion in the three metal groups: engineering and shipbuilding, iron and steel, and non-ferrous metals.

Chemical Industry and the Outlook in Europe*

By Dr. HERBERT LEVINSTEIN, Ph.D., F.I.C.

THAT war involving the principal powers of Europe may come at any moment is clear. I do not say nor think that war on a European scale is necessarily imminent, but the possibility is always there. When it does come it will be sudden and overwhelming. It is not, therefore, surprising that England is attempting to rearm. Our foreign policy cannot be made effective unless it is backed by force.

Industries quite unprepared for war cannot suddenly be switched on to the requirements of war without great delay and immense cost. If planned in peace time and spread over a number of years, rearmament goes forward methodically and comparatively quickly in a totalitarian state. Here in England, where rearmament at present has to be accomplished without dislocating the life of the people or the industries by which they live, the difficulties are much greater. Sir Thomas Inskip, the co-ordinating minister, tells us that the plan for providing an adequate air force and for the requirements of an army not yet mechanised, nor provided in adequate quantity with modern weapons, is succeeding.

Dr. Herbert Levinstein, Ph.D., F.I.C., President of the Institution of Chemical Engineers, 1935-1937.

Many Obstacles

In spite of the ripples from industrial magnates which occasionally break the smooth surface of the pond, no doubt that is so. Nor have I, on the other hand, any doubt that, in so far as the mechanical equipment for the fighting services is being obtained from firms outside the armaments group, many obstacles are being encountered. Such outside firms differ greatly in character and have no or but little centralised organisation. We in the chemical industry went through these difficulties in an acute form during the last war owing to the many independent chemical firms without any central control. We may be thankful, for it is of great national importance, that the chemical industry is to-day more closely knit.

In 1914 war was not expected by the chemical industry here. The idea of war seemed bizarre to the commercial classes of this country. The domination of the great German dyestuffs companies and the dependence of our textile trade on these companies, to take an example, was frequently pointed out by those here engaged in the dyestuff industry. Not one person in the textile industry or the dyeing trade or Government departments took, as far as my experience goes, the slighest interest in such a warning. This was not the case in Germany, where thoughts of war were never far away and talk of war was frequent, if one visited one's competitors in the chemical world in that country.

Production of High Explosives

In the matter of high explosives it was necessary for the War Office to see what industry could do and, at their request the Board of Trade investigated the possibility of increasing the supply and securing the necessary raw materials. A committee was formed, the first meeting of which was held on November 16, 1914. We had then been at war for 3½ months. Of this committee, Lord Moulton, the famous patent lawyer, was the chairman. The composition of the committee is of interest to-day. It indicates clearly the difficulty the Government had in 1914 of approaching the chemical industry. At the beginning, members of the committee had to go round the country with a trade directory—Lord Moulton himself was most energetic in this respect—interviewing manufacturers to undertake the manufacture of high explosives.

At that time the requirements of high explosives were estimated to be approximately 1,400 tons per month. It was found that there were a few firms, mostly small firms, able to manufacture picric acid. In January, 1915, after five months of war, five firms were so engaged, with a total monthly output of approximately 130 tons; T.N.T. was being made by two firms, with a monthly production of 35 tons. The deficiency was large. By November, 1916, there were 17 makers of picric acid in this country, and the production was 449 tons per week or 1,800 tons per month, 14 times the production of the previous year, and more than the total anticipated requirements of high explosives. The total production of picric acid in the country during the war was approximately 71,000 tons, an average of 1,400 tons per month, which was the estimated requirement for all explosives in 1915.

Toluene Requirements

At first the toluene required for T.N.T. was contained in benzol obtained from coke ovens, gasworks and tar distillers. The output of benzol in 1913 was 18 million gallons from coke ovens and five million gallons from gasworks. The extraction of toluene was a problem, as few distillers had suitable fractionating plants. Naturally, the Moulton committee advised that stocks of toluene be requisitioned. Difficulties were experienced, not in placing contracts for the supply of T.N.T., but in obtaining delivery from entirely inexperienced, indeed, ignortant people with whom in certain cases contracts were placed. In due course, as the department grew in strength, knowledge and experience, and their own plants came into operation, some of these works were taken over and administered by the Government. The location of some of these plants was such as to startle any chemical engineer conversant with the manufacture of explosives. A number of them could not be licensed for the manufacture of explosives under the Explosives Act of 1875.

Altogether 16 private firms were employed in making T.N.T., as well as 12 Government factories. In November, 1916, over two years after war was declared, a weekly output of 1,080 tons of T.N.T. was produced from 17 sources, that is, a monthly output of, say, 4,500 tons, over 120 times the output of January of the previous year, and more than three times the estimated total requirements of high explosives originally made. The total production of T.N.T. in this country during the war was 172,647 tons, an average of 3,385 tons per month.

Output of Amatol

The most important high explosive used towards the latter end of the war was neither picric acid not trinitro-toluene, but amatol. Amatol consists of a mixture of ammonium nitrate and T.N.T. in varying proportions, the 80-20 mixture being largely used. The pre-war production of ammonium nitrate in this country was negligible. Calcium nitrate could, however, be imported from Norway, where the Birkeland-Eyde process, in which the Badische had formerly largely been in-

*From the presidential address by Dr. Levinstein, delivered at the fifteenth annual corporate meeting of The Institution of Chemical Engineers on February 26.

terested, was worked on a large scale. The double decomposition of calcium nitrate with the ammonium chloride liquor obtained in one phase of the ammonia-soda process was the method first used in the manufacture of ammonium nitrate. The first contracts for ammonium nitrate gave a weekly output of about 150 tons. With increased plant and the erection of new factories, the weekly output reached the imposing figure of 3,000 tons per week, say, 12,000 tons per month. The total production in this country during the war of ammonium nitrate was 322,181 tons, much more than the combined output of picric acid and T.N.T. To-day when atmospheric nitrogen is converted at Billingham into ammonia, and nitric acid is made by the oxidation of ammonia, all the raw materials for this explosive are found here in limitless profusion. Oxygen and nitrogen from the air and hydrogen, these three "pirouetting in their Morris antics" alone are wanted, coal power egging on the dance! Thus synthesis is called in to aid disruption, adapting that which gives life to give death.

Fuming Sulphuric Acid

Fuming sulphuric acid, christened during the war "Oleum," by which it was known in Germany, never here, was astonishingly lacking in this country. There was a Mannheim plant at Clayton; Nobel's had their Tentcleff plant; there was Messel and Squires' famous firm in London. I am perfectly clear, however, that before the war if we wished to buy oleum from anybody, it came from Germany. The Chamber process still ruled unchallenged in the British Isles. Ship-loads of oleum, packed in drums, had therefore to be obtained from America, packed sometimes in leaky drums—devel's broth for cargo! We became independent of oleum only in the early part of 1916, after a year-and-a-half of war. The national factories put up Grillo plants burning exclusively sulphur, not pyrites. The advantage of sulphur was the saving of cargo space, and that one could erect such plant without knowing how to design a plant to purify the burner gases obtained from pyrites, to prevent the catalyst being poisoned, a very material consideration.

In order to save sulphuric acid it became compulsory to use nitre cake, then a by-product of nitric acid manufacture, wherever possible. The department had no less than 115 different factories, including those of 42 firms making sulphuric acid. By September, 1918, the production of concentrated sulphuric acid (C.O.V.) was 4-5,000 tons per week; oleum, 5-6,000 tons per week.

Lack of Experience in Plant Making

There was little experience here in making chemical plant. Autoclaves, as we used them in the dyestuff industry, came exclusively from Germany, as did all acid-resisting enamel-lined pans. Nearly everything had to be specially designed; little standard plant was available, few well trained chemical engineers could be obtained. In 1916, 250 chemists were recalled from the Chemical Corps in France for service at home, so acute was the shortage, and an appeal was even made to the Australian Government, who let us have 22 chemists. The colossal size of some of the large national factories, which were erected towards the close of the war, will scarcely be realised by those who never saw them. Gretna was nine miles long and 30,000 men were engaged at one time in its construction.

It should not be thought that the machine, as it grew to maturity, was careless of yields. It carried out a great piece of work in a highly competent manner, of which those associated with it may well be proud. Accountancy and costing, for instance, were carried out stringently. The waste lay in the hurried erection of *ad hoc* plants in wartime with largely unskilled personnel, using processes many of which had no peace-time value, a stupendous waste, not only in terms of money, material and labour, but in lives. We were an unprepared, peaceful, individualistic and industrially unorganised people. Thus the war was prolonged almost beyond endurance while we prepared, organised, and then struck.

Very different was the position in Germany. Some years prior to the war the great companies of Farbenfabriken vorm. Friedrich Bayer, of Leverkusen and elsewhere, the Badische Anilin and Soda Fabrik, of Ludwigshafen and Oppau, and the A.G.F.A. formed a combination, and another group was formed by Meister, Lucius and Bruning, of Hochst am Main, the Casella and the Kalle companies. At once, therefore, the German Government had the nucleus of a strongly centralised and organised industry for the chemical side of the production of munitions. During the war these two groups amalgamated and the combination was further strengthened by the inclusion of the Chemische Fabriken Griesheim Elektron, the Chemische Fabriken vorm. Weiler ter Meer, the Leonhardt Company and some smaller concerns, and the great combine now famous as the I.G. (Interessen Gemeinschaft) came into being.

Centralisation in Germany

This centralisation of authority in an industry of such great importance in time of war proved to be of the utmost value to Germany. There can be no doubt that it enabled her to continue hostilities in spite of the blockade, which cut her off from her supplies of imported raw materials. It was possible for newly-discovered processes to be worked immediately in those factories best suited to the required operations and, indeed, the I.G. works produced the bulk of the synthetic ammonia and nitric acid needed for the production of fertilisers and explosives and a high proportion of the high explosives and all, as far as is known, of the poison gas.

In fact, the blockade seems to have given a fillip to the chemical engineering profession in Germany, for we find that when the shortage of materials became pressing, operations were carried out, such as the manufacture of nitric acid from ammonia, the use of paper crepe in the preparation of nitrocellulose and of glycol instead of glycerine, to say nothing of the manufacture of rubber and a dozen substitutes for everyday requirements.

In Germany the organic chemical industry had been developed for many years; the necessary plant was in existence, supplies of a new gas could be manufactured in a comparatively short time and large-scale operations were thus made infinitey easier than in Great Britain. It does not appear that Germany mobilised her dye factories for war service until some time after the outbreak of hostilities, many of the chemists having been called to the colours. With the rapidly expanding consumption of munitions of all kinds (the battle of the Marne exhausted all the German stores of shell), new plant was laid down and many chemists were released from military service. Standardised plant used in the manufacture of dyes was converted for explosives production with extraordinary rapidity; in fact, one plant at Leverkusen, producing 250 tons per month of T.N.T., was put into operation in six weeks. The military importance of a well-organised dye and fine chemical industry thus becomes apparent. The blockade cut Germany off from her supplies of Chilean saltpetre, but she had become independent of them.

No expense was spared on the new factories erected in Germany during the war, the Oppau factory having, it is said, cost nearly £15,000,000. Apparently there was no scarcity of labour for this purpose, nor shortage of the essential materials. At the time of the armistice Germany had the most perfect and up-to-date factories ready to start on civilian production, and there can be no doubt that these fine and elaborate works were definitely designed to ensure that Germany, after her expected victory, would be able to assure compete control of the world's chemical markets.

Present Organisation of Industry

Let us now briefly consider the present position. Since the war there have been several developments of importance in the organisation of chemical industry. The first, and the most important, is the formation of Imperial Chemical Industries, Ltd.. in 1926, with a capital of £65,000,000, an amalgamation of Brunner Mond and Co. and the United Alkali Co. with Nobel Industries and the British Dyestuffs Corporation. This was a mammoth amalgamation, as the various sub-

sidiaries were included; Nobel Industries, Ltd., an earlier merger, alone consisting of about 50 companies, with substantial interests in the metal and other not purely chemical industries.

With the exception of fine and pharmaceutical chemicals, artificial silk, films and photographic material, it may be said that I.C.I. covers the whole of chemical industry. The omissions are mostly part of a sound policy. The I.C.I. does not manufacture finished products where existing firms to whom they supply either the raw materials or intermediate products cover the ground. The formation of the I.C.I. was not in a sense a matter of free choice. It was made advisable, if not imperative, by the great German and American combines which could only thus be successfully met on level terms, a task brilliantly accomplished.

Post-War Organisation

Another important step which took place in 1916, during the war, was the formation of the Association of British Chemical Manufacturers. The main objects for which the Association was formed were to promote close co-operation between chemical manufacturers, to form a medium for placing before the Government and its departments its views on matters affecting the British chemical industry, and to take any other measures which might be for the benefit of the whole industry. It was active in the reorganisation from a war-time to a peace-time basis, particularly as regards the national factories, re-absorption of labour, disposal of waste products, resumption of trade with oversea countries, and more recently it has taken especial interest in the question of safety in works. Its work on problems of railway transport, patents and the Safeguarding of Industries Act has been important, and it has been responsible for the chemical section of the British Industries Fair since 1922.

Chemical Engineers

As the result of endeavours to bring chemical manufacturers and plant workers together, and of the increasing interest in specialised branches of the industry, other associations, now numbering thirteen, have been formed and become affiliated to the A.B.C.M. Among these, mention should be made of the British Chemical Plant Manufacturers' Association, founded in 1920. Another development is the formation of the Institution of Chemical Engineers. This is a direct outcome of the war. The need for trained chemical engineers in industry became apparent during the war, and the late Professor Hinchley gathered together a band of enthusiasts who, after much effort, saw the Institution soundly established. Many, happily, still with us rendered great service, but of those that have gone we owe much to Sir Arthur Duckham, G.B.E., K.C.B., chairman of the provisional committee, and later first president of the Institution.

The Institution has always been deeply interested in the fundamental training of chemical engineers, and has always done all in its power to assist universities and technical colleges which have signified their desire to provide courses in chemical engineering, and which possess the necessary facilities for conducting such courses.

The Institution is an examining and qualifying body and demands a high standard of professional attainment from its members and associate-members. It has a register of trained chemical engineers easily available in time of emergency, its members being engaged in a wide variety of manufactures in a great variety of firms. The Institution can thus supply, in categories according to their professional experience, the names of a large number of trained chemical engineers whose services in war-time industry would undoubtedly be required, and this is appreciated by the relevant authorities, as it would have been during the late war had our Institution then existed as it is to-day.

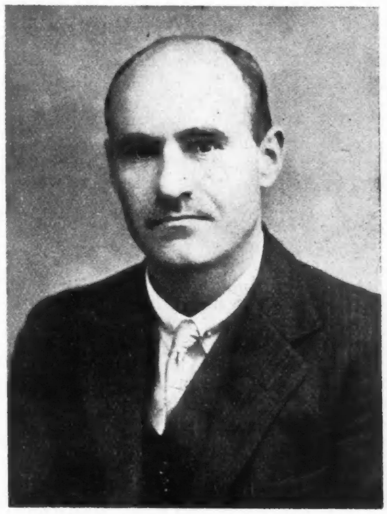
Other countries have their five or four year plans, for they know that war, if it comes, will come swiftly. They wish to mobilise the full power of their population when the bell decreeing mobilisation clangs its sharp decisive note. They do not propose to allow precious time to any they may wish to strike. We are not so unprepared in all matters as may sometimes be thought. At least in the chemical industry we are stronger in every branch; more compact in structure, more complete in scope, with large units ably directed.

If we are forced to interfere more drastically with our industries, particularly our export industries, than we anticipate, in the urgent need for self-protection, it may be necessary to restrict in some measure, perhaps, our imports of food. A well-thought-out agricultural policy, which I suggest should incorporate the principle, never yet adopted, of giving a bonus on increased production, and not merely a bonus on production, could greatly increase the output from our precious grass lands. Milk, butter, cheese, beef, mutton, could not only be obtained in greater quantity, but also with much diminished imports of winter feed than is at present the case. Our profession, as exemplified by the Institution, has a high standard of professional attainment, and increasing strength and membership. It was almost forced into being by the dangers thrust on us nearly a generation ago. It is now firmly established. May it prosper peacefully in complete friendship and co-operation with our colleagues in all countries, with whom we had a happy and fruitful reunion but yester-year!

INSTITUTION MEDALLISTS, 1936

Lord Leverhulme, (left) has been awarded the Osborne Reynolds Medal in recognition of his services as president of the first International Chemical Engineering Congress last year.

Dr. D. M. Newitt (right) has received the Moulton Medal for his paper on "The Design of Vessels to Withstand High Internal Pressures."



Dr. R. H. Pickard Urges Sturdy Individualism

Annual Meeting of the Institute of Chemistry

Dr. R. H. Pickard, F.R.S., who was re-elected president of the Institute of Chemistry on Monday

THE fifty-ninth annual general meeting of the Institute of Chemistry was held in the Hall of the Institute, Russell Square, London, on Monday evening. Dr. R. H. Pickard, F.R.S., president, in presenting the annual report of the council, showed that the membership now included a roll of nearly 6,800 members and 800 registered students. The number of members had increased by 266 during the year.

After referring to the death of Sir Herbert Jackson, a past-president, who had done good work for the country during the war and had subsequently taken a leading part in re-organising the affairs of the Institute during his presidency from 1918 to 1921, he proceeded to illustrate the growing importance of the profession of chemistry.

This year, on October 2, the Institute would attain the 60th anniversary of its original incorporation. The ideals of its founders had been steadily pursued, it had enjoyed the privilege of a Royal Charter for over half a century, and it was honoured by the patronage of the Crown. Chemistry had established its place among the learned professions, and its practitioners were to be found in industry and commerce, in the Government and other public services, and in all affairs of the life of the people.

Chemists, by the very nature of their calling, in which the majority were employees rather than employers, had been for the most part of a retiring and modest disposition, peace-loving, and philosophical. In the past, their science would seem to have been their all-absorbing interest. Those among them whom they knew best were valued for their scientific work and esteemed according to the place they occupied among chemists. That was all to the good; but happily there were also among them not a few who had developed a measure of business acumen, and it had been remarked lately that chemists who were also men of affairs were coming to the fore in increasing numbers. That was a matter of great significance and importance. Everything possible should be done to encourage in the profession a continuous supply of men of that type. Such men were in demand.

Sometimes the requirements of the prospective employer were of a very special character, or in some way too exacting. Men who had attained positions of great responsibility, after experience of many years, were apt to measure younger men against themselves. They looked for the same essential and particular kind of ability, and expected more than was reasonable from those who were eager to be given opportunities of proving their worth. How could they meet this attitude? Those who hoped to secure the higher positions should be prepared and ready for the opportunities and he was not without hope that they would come forward. They needed to cultivate and encourage a sturdy individualism; not the individualism of the hermit, but that of the man of marked character who could stand up for himself without being obnoxious about it, and was, above all, devoted to good service.

He was convinced, when he attended meetings of chemists in various parts of the country that there were, in the profession, young men, many as yet little known, who had courage and initiative to come forward with new work, to read papers, and to make useful and sensible contributions to discussions. To be able to express themselves clearly and with assurance on matters on which they could claim to know something was a valuable asset in itself. He would suggest to the younger members that much could be done to acquire this ability by good reading, by cultivating the habit of mixing with men of other professions, and by taking an active interest, not only on the proceedings of the societies devoted to their science, but in the world of affairs generally.

The supply of men and women for administrative posts was a difficult problem. In most cases, the head of any organisation found himself almost immediately faced with the task of looking for his successor. There was another side of the question, however, namely, that in attaining an administrative post with the responsibility that it entailed, there was a danger of the chemist losing touch with his science, so that it became more and more difficult for him to encourage the workers in the laboratories.

The officers and council for the ensuing year were elected, Dr. Pickard being re-elected president.

Importance of Colloid Chemistry

Professor Riley's Lecture at Newcastle

PROFESSOR H. L. RILEY gave a lecture on "Colloids" at a meeting of the Newcastle section of the Institute of Chemistry at Armstrong College, on February 26, Mr. F. H. Walker presided. An informal supper was served in the University Union before the meeting.

Professor Riley said the term "Colloid" should be used in an adjectival rather than a specific sense. This was clearly shown by the preparation of colloidal calcium carbonate, a compound usually met with in the solid state. Colloid solutions fall between true solutions, which are monomolecular, and precipitates, and the particle size ranges from $1\mu\mu$ to $100\mu\mu$. In substances like proteins, for example, the molecules are so large that a monomolecular solution is colloidal. Adsorption of a solution in agar-agar, etc., will often indicate whether a solution is colloidal or not, since these are not usually adsorbed to any great extent. In general, colloids can be divided into two classes, lyophilic and lyophobic, but this classification is not hard and fast.

Professor Riley then dealt with the preparation of colloidal solutions and illustrated his remarks with a wide selection of experiments. There are two general methods of obtaining colloidal solutions: by dispersion or condensation. Typical examples of the former are solution in a solvent, mechanical dispersion with the aid of a colloidal mill, and dispersion by striking an electric arc under water. Examples of the latter method include such processes as reduction (preparation of a gold sol), and double decomposition. Varying the conditions may lead to different colloidal solutions of the same compound. In conclusion, he stressed the importance of colloid chemistry in a large number of industrial processes.

Institution of Chemical Engineers

Annual General Meeting and Dinner

Dr. William Cullen, who succeeded Dr. H. Levinstein as president at the annual meeting of the Institution of Chemical Engineers on February 26.

THE fifteenth annual corporate meeting of the Institution of Chemical Engineers was held at the Hotel Victoria, London, on February 26. Dr. H. Levinstein, president, was in the chair.

The report of the council showed that the membership increased by 40 during the year and that there was a balance on the right side in the accounts notwithstanding the cost of removing to new offices. Comment was made upon the leading part which the Institution played in the Chemical Engineering Congress which was held last summer, and also on the visit of American chemical engineers who toured this country under the auspices of the Institution. Reference was also made to the evening course in chemical engineering which was held at the Sir John Cass Technical Institute, London, and to the arrangements which are being made for the establishment of an undergraduate course in chemical engineering in the University of London. This course will be offered at the City and Guilds (Engineering) College, South Kensington.

The election of council and officers was as follows: President, Dr. W. Cullen; vice-president, Mr. J. W. Napier; hon. secretaries, Mr. M. B. Donald and Dr. A. J. V. Underwood; hon. treasurer, Mr. F. A. Greene; members of council, Mr. C. S. Garland, Mr. C. S. Robinson and Mr. F. H. Rogers; associate member of council, Dr. D. M. Newitt.

The PRESIDENT then presented the medals for 1936. The Osborne Reynolds Medal was awarded to Viscount Leverhulme, sixth president of the Institution and president of the first Chemical Engineering Congress, and the president remarked upon the exceedingly valuable work which Viscount Leverhulme did in that connection. Viscount Leverhulme was unable to be present and the medal will be forwarded. The Moulton Medal was presented to Dr. D. M. Newitt for his paper on "The Design of Vessels to withstand High Internal Pressures"; the Junior Moulton Medal to Mr. R. F. Hayman (graduate) for his paper on "Corrosion"; and the William Macnab Medal to Mr. G. U. Hopton for the best answers in the associate-membership examinations of 1936.

Presentation to Mr. H. W. Cremer

Mr. H. W. Cremer, who was hon. secretary of the Institution in succession to the late Professor J. W. Hinchley until last year when the duties were shared with Dr. A. J. V. Underwood, has found it necessary, owing to pressure of other business, to resign and he was presented with a gold cigarette case and cheque for 100 guineas as a mark of appreciation of the valuable work he has done for the Institution.

Votes of thanks were passed to the retiring president, to the members of council, to the hon. officers and to the staff.

Dr. LEVINSTEIN then delivered his presidential address, a report of which appears on pages 203-205.

A cordial vote of thanks was passed to the president for his address and the meeting was adjourned until the afternoon when a paper on "Leaching in Theory and Practice" was presented by Mr. M. B. Donald. Our report of the paper and discussion is held over.

The Annual Dinner

The annual dinner was held at the Hotel Victoria, Dr. H. Levinstein presiding; there was a company of some 200 members, guests and ladies.

Dr. W. CULLEN, president-elect, proposed "H.M. Ministers," and Dr. E. Leslie Burgin, M.P., Parliamentary Secretary to the Board of Trade, responded.

Col. the Hon. E. F. LAWSON, proposing "The Institution of Chemical Engineers," said that the chemical engineer had a most important task in the creating, planning and directing of industry. In the 18th century and at the beginning of the 19th century, British industry gained its pre-eminence because of the skill of the workmen and the pride they took in their work, but if British industry was going to maintain that pre-eminence it would do so only through the brains of those who were planning industry and discovering and directing new processes in order to meet the intense competition which now existed. It was necessary that the best brains of the country should be employed on that work.

The PRESIDENT, responding, said that chemical engineers differed from other people simply and solely in the fact that their operations were carried out on a larger scale. Unfortunately, this large-scale thinking was a thing with which we were unfamiliar in this country. Hitherto, everything had been planned on a small scale, but if we were to hold our own in competition with other countries it was necessary for us to change our views and think on the large scale. It was here that the chemical engineer came in. We had at Billingham the largest chemical plant and, in its way, the most all-embracing one in this country, but if that was compared with what was being done in other countries it would be seen what a strong contrast there was. During the afternoon they had had a paper by Mr. Donald on leaching and were told that in the Andes there was a plant dealing with 50,000 tons of ore per day in making copper. Could we conceive of anything on that scale in this country and yet it was being done in what we should probably call a dago country.

Contrast in Petrol Production

Billingham made 112,000 tons of petrol last year. This was a great achievement, but it should at the same time be remembered that we bought about 10,000,000 tons of oil products a year and that the amount of petrol made at Billingham was sufficient only for about 2½ or 3 per cent. of the petrol we used. In Germany they were making five times the amount of petrol by a process analogous to that at Billingham and they were putting down plants to make oil to the extent of about 1,000,000 tons a year. When Germany reached maximum capacity in this respect, which was within a measurable period, she would reach her maximum striking strength. If Germany reached that figure, as it seemed definite that she would, she would be making about 12 times the amount of oil that we were making at the stupendous place called Billingham.

Mr. J. W. NAPIER, member of council, proposed "Our Guests," and coupled with the toast the names of Major-General A. E. Davidson (Director of Mechanisation, War Office), and Sir Alexander Gibb (President of the Institution of Civil Engineers).

The final toast of the evening was "The President," which was proposed by Mr. W. A. S. Calder, to which Dr. Levinstein briefly responded.

Unravelling Complex Reactions

Application of Kinetic Data

THE study of the kinetics of reactions is universally recognised as a means of obtaining information relative to the nature of the processes which are involved in the interaction of substances to form new products, said Professor H.M. Dawson, in an address to the Sheffield Section of the Chemical Society on February 19. Such kinetic data lead very frequently to the conclusion that the actual mechanism bears no simple relation to that which is suggested by the ordinary chemical equation for the reaction concerned.

An illustration of this is provided by the aqueous hydrolysis of the halogen substituted acetates in which the halogan is replaced by the hydroxyl group. In the case of sodium bromoacetate the relation between the original and final substances may be represented by the equation

$$CH_2Br.CO_2Na + H_2O \rightarrow CH_2OH.CO_2H + NaBr.$$

according to which it might be expected that the rate of formation of glycollic acid and sodium bromide would be determined at every stage by the concentration of the unhydrolysed bromoacetate. Until the reaction is complete, the amount of bromide produced is, however, always greater than the amount of glycollic acid, and this fact is sufficient to indicate that glycollic acid is not always produced by the change which gives rise to bromide, that in all probability an intermediate complex compound is formed and that some of the glycollic acid is a product of the hydrolytic decomposition of this intermediate compound.

Progress of the Reaction

In spite of this apparent complexity, it is noteworthy that the progress of the reaction, whether followed by titration of the bromide with silver or by titration of the acid with alkali, conforms closely to the requirements of the simple equation for the chemical change in the sense that the rate at every stage is approximately proportional to the concentration of the undecomposed bromoacetate. That this equation does not correspond with the actual mechanism is, however, clearly shown by the experimental data obtained in the measurement of the velocities of bromide formation for solutions which correspond in composition with those which may be taken to represent successive stages in the hydrolysis of sodium bromoacetate under conditions in which there is no formation of complex intermediates. These conditions may be described as characteristic of "idealised hydrolysis" and the composition of such solutions may be represented quite generally by the formula

$$x\ CH_2Br.CO_2Na + y\ CH_2OH.CO_2H.$$

The velocity measurements referred to show conclusively that the course of the reaction and its velocity at any stage are determined by the rates of six independent processes in which the reacting components, together with the characteristic velocity constants, are shown in the following summary:—

	Reacting Components.		Velocity Constants (25°).
(a)	Bromoacetate ion	+ H_2O	$k_a = 3.2 \times 10^{-6}$
(b)	,, ,,	+ bromoacetate ion	$k_b = 19.3 \times 10^{-6}$
(c)	,, ,,	+ glycollate ion	$k_c = 35 \times 10^{-6}$
(d)	Bromoacetic acid	+ H_2O	$k_d = 2.2 \times 10^{-6}$
(e)	,, ,,	+ bromoacetate ion	$k_e = 72 \times 10^{-6}$
(f)	,, ,,	+ glycollate ion	$k_f = 136 \times 10^{-6}$

In the application of these kinetic data to a solution of the composition $x\ CH_2Br.CO_2Na. + \ CH_2OH.CO_2H$, due account must be taken of the equilibrium represented by

$$CH_2Br.CO_2 + CH_2OH.CO_2H \rightleftarrows CH_2Br.CO_2H + CH_2OH.CO_2.$$

but when this is done, it is found that the observed rate at which bromide is formed in the idealised hydrolysis of sodium bromacetate can be accurately represented at all stages of the reaction as the sum of the velocities of the component reactions (a) to (f).

In general, the relative importance of the six components varies very considerably as the hydrolysis proceeds, but it is noteworthy that the fraction of the total velocity which is contributed by (a) remains nearly constant at one-tenth for the greater part of the course. The approximate constancy of this fraction, the value of which no doubt depends to some extent on the original concentration of the salt, affords an explanation of the apparent simplicity of the change when tested by the unimolecular formula according to which the velocity is proportional to the concentration of the undecomposed bromoacetate. In addition to the six reactions (a) to (f), it should be realised that several others involving the intermediate complexes must play a part when the reaction takes place in the ordinary way. The complete analysis of the system is, however, not a practical possibility.

Fluorescence Analysis

Growing Importance in Industries

THE use of filtered ultra-violet light as an aid to industry in general and to the chemist in particular, was the subject of a paper read by Dr. Julius Grant, M.Sc., F.I.C., before the Bristol and South-Western Counties Section of the Institute of Chemistry, held at Bristol University, on February 19.

The lecturer first pointed out the interesting position occupied in the spectrum by the ultra-violet region, and showed how this accounted for certain of the properties of its radiation. Methods of generating ultra-violet light were then described, and special attention was devoted to a new type of lamp; this consists of a straight quartz tube which is activated by one of the rare gases and his electrodes coated with electron-emitting salts of rare earth elements. Advantages of this over the older type of mercury arc are ease of starting, an ordinary switch being all that is required, and simplicity of design. Filters suitable for fluorescence analysis were also described, and this led to a consideration of the general technique of the method. Important in this connection is the use of ultra-violet light as a source of illumination for the microscope. This frequently enables structures to be seen which would otherwise remain invisible, and the range of usefulness of the method is further increased by staining the preparation with fluorescent materials. The photography of fluorescence effects was also discussed..

The major portion of the lecture dealt with a selection of the numerous applications of the method to academic science and technology. The detection of impurities can be carried out if the impurity (or the substance which it adulterates) is fluorescent, preservatives in foodstuffs being an example. The method may be made quantitative by matching the fluorescence against that of a standard (*e.g.* evaluation of mixtures of wood pulps, butter and margarine, pigments, etc.). The method also serves as an indicator for chemical reactions if these produce a fluorescent substance from a non-fluorescent substance, or *vice-versa*; examples are the detection of bromides, various sugars, sulphites, etc. Furthermore, indicators are available whose fluorescence varies according to the pH value of the medium in which they are dissolved, and these are used not only to determine the pH value of coloured or turbid liquids, but also as indicators in volumetric analysis using both neutralisation and precipitation reactions (*e.g.* the determination of chlorides, zinc, etc.). Similarly, indicators of physical effects (*e.g.* penetration, distribution, etc.) have also been devised.

In illustration of the varied applications of the method examples were cited from the agricultural, pharmaceutical, paper, rubber, paint, textile, foodstuff and sugar industries, as well as from " pure " organic and inorganic chemistry.

Letters to the Editor

Dyestuff Pioneers be Blowed !

SIR,—I would suggest to my good friend Mr. Cronshaw that he shift his organ to the next street and start a new tune. He never has nor ever can understand the evolution of the dyestuff industry: simply because he never knew the men concerned nor the times. Why mislead the commercials?

Perkin, Nicholson, Greville Williams and Witt, with others in the background, the great Hofmann towering above them, set sufficient example but enjoyed no proper *commercial* support. Hofmann left us in disgust as the merchants denied him straw. Perkin was beaten by very superior foreign forces. Brooke, Simpson and Spiller, under whom were Meldola, Green, Friswell, etc., were hopelessly narrow in outlook. The field was left to the free lance Levinstein, who for a time was clever enough to overcome the Badische, Baeyer's and Martius—showing what was possible.

Morgan has brought out the dogged independence and determination of the Huddersfield group, but has left the story far from finished; it is Green's turn and duty to finish it but he will not take the trouble. Nothing can be done when the chief historian will not write history. Milton has written the epitaph of average English commercial men—*Blind Mouths,* like the Bishops.

I would urge Mr. Cronshaw to turn to the present and the future. Where are his pioneers? Most of his scientific advisers are not known to have shown much imagination in colour. Chiefly photographers seem to have used their wits in connection with dyestuffs. What encouragement does Mr. Cronshaw offer for the future? Has the young man a chance to develop?

In 1888 I started discussion on the "Origin of Colour." As a broad description my explanation still holds. In Germany dyestuff manufacturers might have sought to retain me: here not sixpence was ever offered to me, even by Mr. Cronshaw. So do we hail the pioneers. An Alfred Mond is displayed superior upon Imperial Chemical House. *No Double Hexagon* memorial tablet, sacred to the *Memory of the* 10 *Dichloronaphthalenes,* etc., etc., is affixed to the modest front of Hexagon House.—Yours faithfully,

HENRY E. ARMSTRONG.

Scientists and Gas-Proof Rooms

SIR,—May I, for one, express appreciation of the points Professor W. A. Bone raises in his letter. The cynical gibe of Mr. Geoffrey Lloyd in Parliament at some Cambridge scientists—the suggestion of ulterior motive would seem to boomerang much more effectively on an Administration self-confessedly usurping power on generalised electoral deception—is sure to be resented by numerous scientists, cf., the sister university by-election result.

Houses are nearly always built with cavity walls, and where they are not, the porosity of bricks is soon witnessed, generally, on interiors. Also, where in old houses, damp-courses have been omitted, walls are often dripping wet inside rooms. Chemists have only to ask themselves whether bricks which, without special aid, are non-waterproof by common experience, can be gas-proof in despite of the natural dynamic force implied in the gaseous diffusion laws. In the case of water passing through, capillary action alone is apparently concerned. In the case of gas passing through, capillary action preceded by diffusion pressure. The cavity in house walls keeps out most wet, but despite it, dampness (air-borne moisture) often passes right through. It seems obvious then that gas will diffuse across cavities into interiors. This may require some persistence of external gases, but "gas-proof rooms" are, presumably, required just to meet such persistence—respirators being otherwise applicable. And that persistence, of course, introduces the further complication of ventilation discussed by Professor Bone.

The only ways of ensuring gas-proof rooms, therefore, seem to be (a) to build them of continuous walls of completely non-porous material, in which case ventilation would become a much more serious problem; or (b) to build them of continuous walls made of some semi-permeable membrane which passed air and expired air, but completely detained poisonous gases or fumes. The latter is the ideal method, but such a material would have to be discovered. There is one other possibility. This is to build continuous (jointless) walls of the same adsorbent material as is used in respirators (assuming this to be efficient in all possible cases which also seems to be in doubt) without modifying the condition of the material in so doing.

If normal brick walls are gas-adsorbent, it might be much cheaper for the Government to use mere brick dust in respirators!

The above efficacious methods are impracticable for what is regarded, or ulteriorly manufactured, as an emergency, and the only real, general, preventive is a belated return to the sanity of discussion and adjustment of differences, as suggested by Professor Bone—which is the only method for which a truthful, real, mandate has been given by the people of this country, incidentally (Peace Ballot). Such discussion should range around the establishment of a World Air Board, as suggested in 1934. Immediately any aircraft of whatever kind crossed its own frontier it would automatically come under the authority of the World Air Board which would be entitled to know every detail about power, destination, object of flight, and cargo carried, and every aeroplane —in flight or not—would be compelled to report itself at stated intervals by wireless to the board whilst outside its own national frontiers. In the case of warlike attempt by air, the responsible nation would be economically boycotted by all others. Once aircraft ceases to be over its own territory its equipment and objects become the concern of all other nations.

If this best method for all is, deplorably, not seized, then the next best thing is to keep poison gas completely out of the country by building-up the insularity of the British Isles in the air to replace that Channel insularity now lost due to air transport. To do this will require some widespread automatic means, as near natural as possible, rather than a mere mechanism such as a gargantuan-cum-quixotic balloon suspended apron.

Such an automatic defence would be the erection to a great height all around the coast of a belt of noxious dispersions in the forms of smoke clouds. To obtain this air-insularity and maintain it, the greater part of the material is already provided and ripe for removal, from over our cities each day. The means required would merely be those of bringing the material which forms these smoke clouds under control so that they could be removed from their present situation (thus destroying atmospheric pollution) and dispersed in chosen situations where they would be of positive defensive value against aircraft. The act of control would also mean that such a smoke curtain could be intensified or modified at will in extent, or nature, or both. Since these variations in chemical or physical nature could be kept secret the smoke curtain would act as an exceedingly powerful deterrent, even stronger than under-water mines in Channel insularity.

The money wasted positively as smoke in Great Britain since coal was first burned must be of the order of the £400,000,000 loan, to which is to be added all the loss and ill-health it has caused. This waste could thus be utilised for defence, saving further waste, if the ideal way of discussion, adjustment, and the formation of a World Air Board are tragically denied. Science is beneficent towards all, whilst that of economics is exclusiveness and selfish gain for individual persons or nations.—Yours faithfully,

S. C. BLACKTIN.

20 Denton Avenue, Leeds.

Turbo-Stirrers for Laboratory and Semi-Industrial Use

Stirring Action Modified to Suit Process

TURBO-STIRRERS of laboratory and semi-industrial size, for the rapid and thorough mixing of fluid or viscous liquids, fluid masses containing clotted or lumpy suspensions, and syrupy masses are supplied by the Moritz Chemical Engineering Co., Ltd. These turbo-stirrers are specially recommended for agitation, emulsion, reaction, projection, nitration, sulphonation, neutralisation and other processes. They are compactly built and free from vibration. All moving parts are masked and it is therefore possible to place in the vessel containing the mass to be stirred, any controlling instrument such as a thermometer or a hydrometer, without risk of breakage. Owing to their design, a hydraulic seal forms itself between the impeller shaft and the tube through which it passes, a feature which dispenses with the necessity of fitting a gland.

Another interesting feature of these Moritz turbo-stirrers (Fig. 1) is that when they are not required for stirring purposes, their driving unit can be utilised to drive any other apparatus or instrument by means of a grooved pulley fitted at the upper end of the motor spindle. An even more interesting feature is that Moritz contact parts of different design are readily interchangeable. For instance, a turbo-agitator unit can easily be replaced at the end of the motor output shaft by an emulsifier unit, or a reactor, or a projector. Stainless steel is standardised for impellers and other contact parts, but they can be manufactured in other metals or materials to suit users' particular requirements. The drive is provided by electric motors of British manufacture, 1/25th to 1 h.p. according to shape and size of contact parts and the consistency of the mass to be stirred. A special coupling gives easy connection of the stirring units to the motor shaft. A variation of stirring speed is made possibe through a special potentiometer supplied with every set.

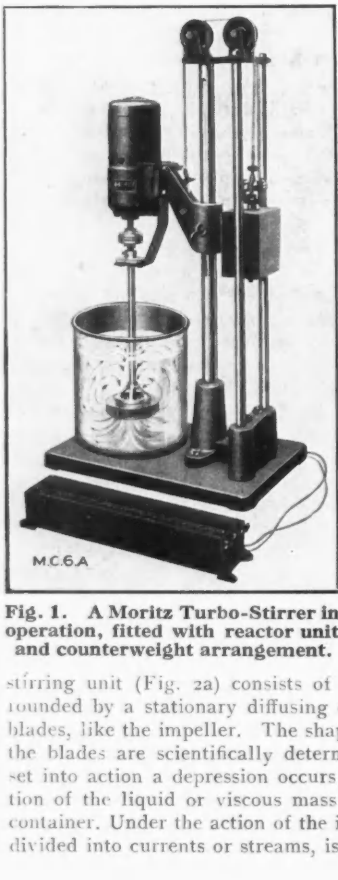


Fig. 1. A Moritz Turbo-Stirrer in operation, fitted with reactor unit and counterweight arrangement.

The turbo-agitator stirring unit (Fig. 2a) consists of a revolving impeller surrounded by a stationary diffusing crown, also provided with blades, like the impeller. The shape, number and position of the blades are scientifically determined. When this unit is set into action a depression occurs causing a continuous suction of the liquid or viscous mass towards the centre of the container. Under the action of the impeller, the mass, already divided into currents or streams, is thrown against the blades of the stationary crown; this divides the currents still more and forces them to intermix intimately within the mass. Owing to the impeller action described, the bottom of the container is constantly swept by streams which, subsequently, rise vertically along the sides of the container carrying everything on their way. Then, the streams complete their circuit by travelling downwards until they reach the centre of the vessel, and the same movement of agitation repeats itself until the apparatus is switched off.

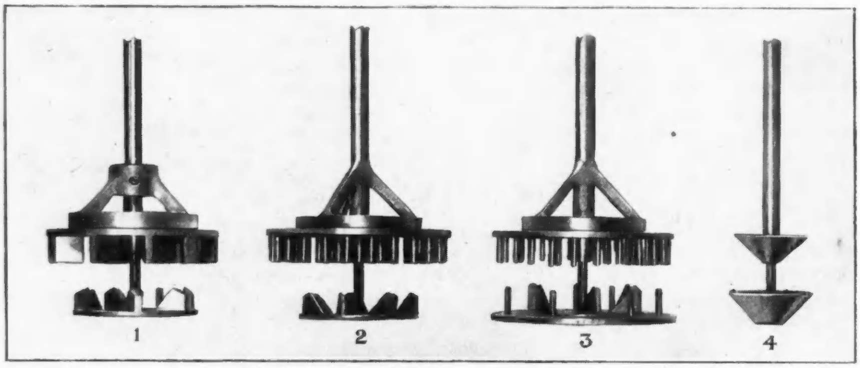


Fig. 2. Four types of Stirring Units can be fitted to the Moritz Turbo-Stirrer. (a) Agitator. (b) Emulsifier (c) Reactor. (d) Projector.

In the turbo-emulsifier (Fig. 2b) the stationary diffusing crown is replaced by another type of crown carrying a fairly large number of cylindrical pins instead of blades. The mass, either liquid or viscous, thrown by the impeller at high velocity, meets the pins and is divided and dispersed, *i.e.,* the streams created by the impeller action are broken up into a much greater number of streamlets; this action emulsifies the mass very quickly. In the turbo-reactor (Fig. 2c) an impeller also fitted with pins as well as blades revolves between the pins of the stationary crown described above; in this way the dividing effect is increased, and the apparatus can be used to break up clotted or lumpy substances within a mass, or to disperse two non-miscible liquids within one another. The turbo-projector (Fig. 2d) is often used to project liquids into a gaseous atmosphere, in order to increase the surface of contact between the liquid and the gas, thus accelerating chemical reactions or physical exchanges (*e.g.* evaporation).

New Dyestuffs

Addition to the Duranol and Dispersal Range

DURANOL BRILLIANT YELLOW 6G300 POWDER, an addition to the I.C.I. range of Duranol and Dispersol dyestuffs for the dyeing of acetate rayon, is of particular interest on account of its extremely bright and very greenish-yellow (non-phototropic) shade, which has a greenish fluorescence and because it is faster to light than any other product of similar shade at present on the market. It is suitable for the dyeing of all forms of cellulose acetate materials and possesses very good level dyeing properties combined with very good water, washing, scrooping, perspiration and chlorine fastness. It can be used in conjunction with other members of the Duranol and Dispersol ranges for the production of combination shades, being specially useful as a component of bright greens possessed of good fastness to light. It may also be applied along with other classes of dyestuffs, such as CR Chlorazol dyestuffs, for the production of solid or contrasting shades on mixed fabrics containing acetate rayon, as it is unaffected by the presence of acid, alkalies and salt.

Chemical Methods of Treating Sewage

British, American and German Practice

BRITISH, American and German practice were dealt with at a symposium on chemical methods of treating sewage held at a meeting of the Institution of Chemical Engineers, in London, on February 17, when Dr. Herbert Levinstein (president of the Institution) presided.

According to Mr. J. H. Garner, B.Sc., F.I.C., in his contribution on British practice, the direct discharge of sewage into rivers or on to the land has now almost entirely discontinued; generally, the only towns discharging large volumes of crude sewage are situated on tidal waters; and in very few cases is crude sewage now dealt with on land. Towns where the sewage, either from some peculiarity, or during passage through extensive sewerage systems, tends to become septic by the time it reaches the purification works, and towns where the works are constructed in populous districts have created new problems. In such cases, it is desirable to prevent septic conditions which would create aerial nuisance or interfere with purification processes. These difficulties are now more easily overcome owing to the ease with which cheap and ample supplies of liquid chlorine can be obtained and scientifically applied to sewage liquids. The service departments of those companies who supply liquid chlorine and chlorinators deserve much of the credit for the progress which has been made.

Chlorination of Crude Sewage

It is estimated that no less than one hundred authorities in this country have recourse to chlorination either at seasonal periods or continuously, mainly for the prevention of odours and septicity. Perhaps the most interesting case in which chlorination has recently been applied to crude sewage before it is discharged into a river is that of Bristol. As an alternative to incurring a capital cost of £800,000 and an annual expense of £3,000 for pumping the sewage into the tidal River Severn, where dilution would be adequate, it was decided to chlorinate the sewage before it was discharged into the River Avon. The object is to arrest decomposition and render the sewage innocuous until it reaches the River Severn. Tidal observations showed that decomposition must be delayed 3 to 4 days, and under certain conditions 5 to 6 days. During the first year's operations, chlorination was carried on from 8 a.m. to 11 p.m. daily, that is, during the period of maximum strengths and rates of flow of sewage. It was ascertained that chlorination on a basis of 25 per cent. of the aggregate chlorine demand effectually checked septicity and had a definite, though incomplete, effect on odour nuisance. Experiments showed that more intense chlorination gave better results, and that 50 per cent. of the aggregate chlorine demand should prevent odours under the most trying weather conditions. Additional chlorinators were therefore installed.

Practice at Bristol was based on research work on chlorination for prevention of septicity carried out at Sheffield sewage works in 1933 by the late Mr. John Haworth, in collaboration with Mr. C. Lea, of Imperial Chemical Industries, Ltd. They found that chlorination of sewage to about 50 per cent. of the chlorine demand is sufficient to prevent septicity during incubation for seven days at 20° C, and, under certain conditions of dilution, chlorination to 25 per cent. would be sufficient.

Chemical precipitation processes are now only concerned with the removal of the suspended and colloidal matters from sewage. The clarification process depends essentially upon the formation in the sewage of a flocculent precipitate by the reaction between a suitable chemical or chemicals added to the sewage and some constituent of the sewage. With the coagulation and settlement of the floc, suspended and colloidal impurities are deposited as sludge.

Clarification, in addition to the primary chemical action, is partly physical, namely, precipitation of colloids, and partly mechanical, namely, entanglement of suspended particles, which in their very finely divided state would settle very slowly or not at all. In this country, the only chemicals now used to any appreciable extent are lime, aluminium and iron salts, and sulphuric acid. Out of approximately 360 sewage works varying greatly in size in the West Riding of Yorkshire, 44 use aluminoferric, 6 employ lime, 4 sulphuric acid, 2 lime and aluminoferric, and 2 ferric sulphate. These figures are unlikely to be representative of the whole country, as the West Riding includes many industrial areas where the sewage is either strong domestic or contains trade wastes. It has been difficult to obtain definite figures relating to the whole of Great Britain, but the available information indicates that only about 10 per cent. of approximately 3,000 works of various sizes use chemicals for precipitation processes.

Aluminoferric as a Precipitant

There seems to be no doubt that aluminoferric is still the most widely used precipitant in this country. It was first produced in its present proprietary form about 1875, by Peter Spence and Sons, Ltd., Manchester, and contains approximately 92 per cent. of hydrated aluminium sulphate, together with a small amount of ferric sulphate. It is supplied in oblong blocks weighing about 50 lbs., one or more of which are usually placed in the main channel leading to the settling tanks. It is then generally assumed that, provided a suitable number of blocks is maintained in position, the greater the flow of sewage the greater the amount of precipitant dissolved; that is, the supply of the proper amount will be automatically adjusted. This is, of course, rather a crude method, and does not allow for variations in the strength of sewage, a defect which may be partly remedied by the mixing of the sewage during its passage through the settling tanks. Under ordinary conditions and with suitable attention this method is capable of producing good results.

Sulphuric acid has been used for the treatment and recovery of grease from soapy textile refuse since the middle of last century, and the methods then in use were reported upon by the 1868 Rivers Pollution Commission. As early as 1874, a process for precipitating sewage with a mixture of 2 parts of sulphuric acid and 1 part of hydrochloric acid was patented by Schmersahl, but he also specified the subsequent addition of a little lime. The advantages of using acid in conjunction with aluminoferric in treating alkaline sewage have already been mentioned. At present, acid precipitation of sewage is carried out at only four towns, all of which are in the West Riding of Yorkshire. At three of these towns, Bradford, Halifax and Morley, grease and fertiliser are produced from the acid-precipitated sludge.

Recovery of Grease

The sewage of towns in which there are factories engaged in scouring wool contains an abnormal amount of soap and grease, owing to large volumes of scouring refuse being discharged to the sewers. There has, however, been a general tendency for the amount of soap and fatty matter in all sewages to increase side by side with improvements in sanitation. The addition of sulphuric acid, usually in the form of brown oil of vitriol, in slight excess to soapy sewage liquids, splits the soaps, liberating small "curds" of fatty acids. At the same time, change of reaction from alkaline to acid brings about coagulation and flocculation of the finely-divided solids and colloids of the sewage. The particles formed by entanglement and adsorption of the fine solids by the fatty matter settle fairly quickly, leaving a liquid almost free from grease and containing less organic matter in solution than the original sewage.

Vitriol or strong "waste acid" obtainable from chemical

works within reasonable distance is added, and well mixed with the sewage before it enters the settling tanks. At Bradford a large proportion of the acid required is made in a modern sulphuric acid plant at the sewage works. Good clarification generally occurs when the *p*H is between 3.5 and 4.5. This degree of acidification would be a big disadvantage in subsequent biological purification, were it not that alkalinity to about *p*H 6.0 can readily be effected during tank treatment. On the other hand, acid precipitation has the definite advantages that it prevents septicity of both liquid and sludge; produces a denser sludge; limits sludge production by avoiding the introduction of the large amount of inorganic matter which results when lime, iron salts or alum are used for precipitation; and yields a sludge in a suitable condition for the subsequent recovery of grease and production of fertilising material.

Experimental Process at Chicago

Mr. HARRY H. HENDON discussed modern chemical treatment of sewage in the United States of America. He said that many of the schemes or processes for the chemical treatment of sewage developed in recent years were based upon laboratory tests or small scale experimental work. Such experimental work in many cases was only carried out for a brief period before publicity was given to the results obtained, but when further researches were made on a larger scale most of the more complicated schemes were simplified or abandoned, as for example the discontinuation of the use of paper pulp at Dearborn, and the simplification of the stage precipitation at Palo Alto. The more complicated processes using two or more chemicals, together with insoluble materials, have been used to a very limited extent in actual plant installations, the simpler processes being more favoured. The experimental plant at Chicago gave excellent results, but has never been used, probably because the process was too complicated. Approximately fifty chemical precipitation plants are in operation, and twenty-four additional plants are under construction in the United States.

There are many chemicals which may be used in sewage coagulation; the most economical one for a given case depending upon its effectiveness and the position of the sewage plant with respect to the point of supply of the chemical. By-products from the steel and chemical industries are being used more extensively at constantly decreasing prices. The chemicals commonly used for the coagulation of sewage are ferric chloride as a liquor, crystals or in anhydrous form; ferric sulphate in both the commercial and anhydrous forms; chlorinated ferrous sulphate, chlorinated copperas; chlorine and iron scrap, ferric chloride; ferrous sulphate and lime; aluminium sulphate; sodium aluminate; and lime or sulphuric acid for *p*H control. These coagulants may be used along or in combination, or with some insoluble material such as paper pulp, marl, clays, etc., or with return sludge; the insoluble materials will increase the volume of sludge to be handled and disposed of.

Chlorinated Copperas

Chlorinated copperas is the most widely used coagulant. This is due to the fact that ferrous sulphate is non-corrosive and is easily handled. Ferric chloride syrup or liquor in rubber lined tank cars is economical for the larger plants. Anhydrous ferric chloride or ferric sulphate may be economical for isolated plants where freight rates are relatively high.

The Coney Island plant which began operations in 1936, has a capacity of 35,000,000 gal. per day. The present flow is 15,000,000 gal. per day and the flow in 1970 is estimated to be 140,000,000 gal. per day. The reason for selecting a chemical process were the limited acreage available and the protection of the neighbouring bathing beaches during the summer months. Chlorinated copperas and lime are used as coagulants, the plant effluent also being chlorinated. During the winter season plain sedimentation is used. The plant is designed so that filters may be added in future, if necessary. The sludge is digested and the gas is collected and converted into electrical energy for use on the plant by dynamos driven by gas engines. Digested sludge, either in the raw or filtered state, may be carried to sea in barges. This is probably the simplest of the large chemical plants which have been installed to date, the sewage passing through the following equipment in the order named; sewage pumps, mixing channels, mechanical flocculators and settling tanks. The chemical feed is controlled automatically by the sewage meters. The ferrous sulphate is delivered by water and transferred to storage by pneumatic conveyors.

The extent to which chemical precipitation will be used in future is, of course, unknown, but its advantages and limitations are now well known to most sanitary engineers. Where a uniform amount of domestic sewage has to be treated continuously, chemical processes will probably not be seriously considered. On the other hand chemical treatment will be used extensively for special conditions such as seasonal treatment, industrial waste, and as an aid to other processes. Chemical precipitation has a definite but limited place in sewage treatment. There is, however, no justification for the claims of some of the promoters of patented processes, who are attempting to sell various schemes for the chemical treatment of sewage which claim to accomplish impossible results under all conditions at estimated costs of operation which are absurd.

Dealing with the chemical treatment of sewage in Germany Dr.-Ing. Karl Imhoff said that since 1905 no new chemical plants for dealing with sewage have been constructed because mechanical and biological processes have proved to be more economical. In many towns chemical precipitants were abandoned after being in use for a few years because it was found that the clarification effected in settling tanks without the use of precipitants was only slightly worse than with precipitants. This was the case at Frankfort. In other towns the results produced by chemical precipitation did not meet local requirements and it was found necessary to abandon them in favour of biological processes or irrigation. This has been the case at Dortmund, Leipzig and at various places around Berlin. In the district of the River Emscher, following the conversion of the river into an open sewer channel, chemical precipitation was abandoned at Essen and Bochum in favour of simple sedimentation.

Treatment of Trade Effluents

Chemical treatment of trade effluents is used in a good many instances, especially at metal pickling works, tanneries, chemical factories, and in the textile industry. It has an application when the special nature of the trade waste renders biological purification of little use. Such may also be the case with the sewage of a town which contains a very large proportion of trade waste. An example in this category is the large sewage works which is being built at Neersen by the Niersverband, of Vierssen, and which has to deal mainly with waste waters from the textile industry. These works have been designed as the result of many years experimental work by Dr. Jung in developing a special precipitant from iron and carbon dioxide. The active precipitant is ferric hydrate, which is prepared by first saturating the crude sewage with carbon dioxide, from flue gases, and then bringing it into contact with iron turnings. Bicarbonate of iron in solution is obtained according to the equation

$$Fe + 2CO_2 + 2H_2O = Fe(HCO_3)_2 + H_2.$$

Aeration of the sewage next converts iron bicarbonate into ferric hydrate and the carbon dioxide is given off according to the equation

$$2Fe(HCO_3)_2 + O + H_2O = 2Fe\ (OH)_3 + 4CO_2.$$

The whole operation only requires 30 mins. The volume of flue gases for carbonation amounts to 1.5 c. ft. per c. ft. of sewage and the volume of air for aeration is the same. In this process the biochemical oxygen demand of waste waters from the textile industry is reduced by 60 to 70 per cent.; the quantity of iron used is said to be only half as much as when

using ferric chloride. A further advantage is that the treated sewage is not acid but neutral or slightly alkaline, because the bulk of the carbon dioxide is driven out in the aeration process.

Points from the Discussion

Dr. CALVERT (Ministry of Health) after introducing the paper by Dr. Imhoff—who was unable to be present—referred to the lignite process which only seemed to have found favour in Germany. Many years ago he had opportunities of seeing this process in operation at Neersen as well as at Potsdam, and he said he would not be surprised if a revival of a process of this kind might not possibly form part of our newer knowledge of chemical precipitation of sewage.

Mr. H. C. WHITEHEAD (Birmingham, Tame and Rea Drainage Board) said much of the soluble fermentible matter present in ordinary sewage, and in many trade wastes, was left untouched by chemical methods of treatment, and where fairly complete purification was required, chemical treatment was not an acceptable alternative to biological methods. He did not wish to minimise the importance of chemical treatment, because there were certain sewages which could only be approached by preliminary chemical treatment. Mr. Garner had pointed out that increases in chemical treatment of sewage in this country had been most marked in the direction of deodorising and prevention of septicity. That was all to the good as a means of nuisance reduction during purification, but chlorination of sewage was a poor substitute for purification. Sewage works managers in this country were more familiar with chemical pollution than with chemical purification of sewage, and would welcome more efficient means for the reduction, or re-use, of trade wastes at the factory.

In connection with the control of septicity of sewage or smell prevention during treatment, they had been using lime and chlorine at Birmingham for many years to control septicity during the time which elapsed between the reception of the sewage and the final effluent in the oxidation processes. Recently, they had made a virtue of necessity. They had to receive into their sewage an average of about 700 million gallons of spent gas liquor, and this had been a nuisance for many years largely as the result of the intermittent discharge; in spite of assurances to the contrary he had reason to suspect that he had been receiving seven days output of gas liquor sometimes in four days, and at very irregular hours during the working day.

Chemical Precipitation Becoming Extinct

Mr. J. H. EDMONDSON (Sheffield) remarking that apart from the increasing use of chlorine for prevention of septicity and odour control and the special cases mentioned, chemical precipitation in Europe had become practically extinct, and it was in chemical precipitation that chemical engineers were mostly interested because of the recent invasion of patented processes emanating from America. Mr. Hendon had certainly reduced the extravagant claims which had been made for American plants, and these conclusions had also been supported both by Mr. Garner and Dr. Imhoff. Moreover, American conditions were quite inapplicable to the conditions obtaining both in this country and in Germany. Prior to his appointment at Sheffield, he was at Halifax, where he had installed a flocculating plant with the object of improving the solid from the sewage which contained waste from the textile trades involving 20 per cent. additional solids. He had been rather enthusiastic about the results obtained, but later he experimented further with metallic precipitants and was able to show a saving of 25 to 32 per cent. in the chemical required. These results, however, had been obtained with experimental apparatus, but they had been substantially confirmed by Owens' work mentioned by Mr. Hendon. We could not be expected to obtain in this country results equal to those being obtained in America, because of the large flow per head of population in America, which was five times as great as in this country. Another point about American sewages was that they were very weak and they took quite a lot of chemicals to precipitate them, and generally it seemed that American methods of chemical precipitation were not so economical as was the case in this country. Reference was made in Mr. Hendon's paper to the production of ferric chloride on site. It would be interesting to know what type of material was used for the tower, in order to withstand the action of chlorine on the ferric chloride.

Mr. A. SCIVER remarked that it did not seem that we had done enough with chemical processes in this country perhaps for the reason that very few had had a chance to go "all out" with regard to them. Having visited a large number of sewage works he believed he was right in saying that no one really took the trouble to measure the amount of chemical added and no one took the trouble to adjust the pH properly; therefore, in such conditions it was not fair to say that sewage works managers in this country had had a proper "shot" at treating sewage by chemical means. He was engaged with a certain engineer at the present time who was drafting the design of a system, but the trouble was that it was necessary here to place all one's ideas before a certain Ministry where there were certain Mandarins, who did not always look on engineers in quite such a friendly manner as was hoped. He felt there was a very big future for chemical treatment, but he did not think it was ever likely to replace biological purification, at any rate in most cases.

Filtration to Give 80 per cent Cake

Mr. W. KING PORTEOUS said that chemical precipitation should be considered separately for throwing down the solids from the sewage or for conditioning the sludge for filtration. The latter was very important because it concerned the disposal of the sludge which many sewage works managers had a great deal of difficulty in doing. He understood that filtration was carried out in Chicago by vacuum filters, after ferric chloride treatment, and that this resulted in a cake containing 80 per cent. of moisture. If the filtering treatment could be dispensed with, a very big saving could be made in sludge treatment. In addition, it was necessary to reduce the moisture content down from 80 per cent. by some method of filtration, and if that could also be dispensed with another very big saving would be made. There were possibilities of treating the sludge with salt and then it was possible to get down, by vacuum filtration, to about 60 or 65 per cent. of water, or by filter beds to about 35 or 40 per cent. of water. The difference was very great. To reduce a sludge containing 80 per cent. of water, the fertiliser containing 25 per cent., required a great deal of heat, and if a start could be made with a sludge containing only 40 per cent. of water a very considerable saving in heat could be made.

Dr. A. PARKER said the work that had been done in America had led some people in this country to turn over in their minds the possibility of using chemical treatment only because of its low cost for such wastes as washing waters from dairy milk collecting depots and cheese factories, and possibly other wastes with organic matter in solution.

Mr. P. G. LLOYD said he felt that Kingston occupied a place of some standing in chemical precipitation processes, which had actually been working there for the last 49 years, and although open to contradiction, the Kingston Corporation had experienced less trouble with their sewage works and their effluent than many other works which he could name. In the recommendations of the fifth report of the Royal Commission it was said that with 150 to 300 volumes it would be unnecessary to take the dissolved oxygen test of solids beyond 6 parts per 100,000. He suggested that had these recommendations been adopted, chemical precipitation would have met the case. The Royal Commission also recommended that with 300 to 500 volumes, the solids should be 15 parts per 100,000, and he suggested again that chemical precipitation would have met the case. He had been able with a good chemical precipitation process to filter at the rate of 150 gallons per cubic yard.

Mr. HENDON replying to the question as to the chloride towers, said these were made of "ordinary ceramic materials."

Heat Resisting Muffle Equipment

Desirable Qualities of Alloys

MR. A. L. FAWKES read a paper on "Heat Resisting Muffle Equipment" at a meeting of the Northern Section of the Institute of Vitreous Enamellers, on February 4, at the Queen's Hotel, Manchester. He summarised the desirable qualities of alloys, saying the metal of the perrits or frames must resist scaling at temperatures certainly not less than 1,000° C, and the oxide must be strongly adherent with the most rapid alternate heating and cooling. The strength must be such that the temperature of operation did not result in deflection under load beyond economic weight-load ratio.

The alloy must accommodate any warpage due to speeding up of fusing, probably causing overloading during service, being rectified periodically by straightening and welding if necessary. Where constructed frames entailed welding the alloy must be of composition which ensured that the strength each side of the weld was equal to that of the weld itself, and the resultant alloy of the weld must conform with the non-scaling properties of the casting.

The surest approach to the correct use of heat resisting alloy was by the elimination of the unfit and both users and suppliers were desirous of establishing working principles which would be of service in the constantly growing industry of vitreous enamelling. Mr. Fawkes said he had every confidence that the requirements of the trade could be met by heat-resisting alloys of quality unsurpassed in the world.

The Small Factory

Defects in Finance and Organisation

FINANCE and organisation in the small factory was the subject of a lecture to the Chemical Section of the Manchester Literary and Philosophical Society on February 26. The lecturer, Mr. F. C. Lawrence, B.Sc. Tech., A.M.I.E.E., F.C.W.A., who is a consultant in organisation, gave a number of examples of the defects found in small factories and of the means by which these had been corrected, thereby turning losses into profits. Amongst them, he instanced the payment of piecework on an unsound basis, the absence of planning and progressing, inadequate and uncontrolled selling effort, excessive stock, out of date systems for book-keeping, costing, purchasing and sales management, and the high cost of departmental organisation in the small concern.

In most cases, such faults arose from lack of understanding on the part of the management. There is no specific training for management and administration. Experience is not sufficient. It is necessary for a manager to be not only technically equipped but also to be trained in finance and organisation. He must be capable of understanding every activity in the business and must be able so to use every function in a way that will lead to net profit. Net profit is the supreme test, because, without profits, there is no opportunity to expend money on improvements, expansion and better conditions for the workpeople.

In small firms, said Mr. Lawrence, one of the most valuable possessions is the family spirit, which cultivates team work throughout the organisation, but it cannot be expected that each successive generation of the family will be completely equipped to administer and manage the business. If, in one generation, the owner of the business is unable to cope with all its many activities, it is essential that he should seek assistance to ensure that his organisation is completely equipped in all branches, to meet present-day demands. Re-organisation may mean the introduction of new systems into a business, but, if there is something lacking in management and administration, those systems may be of no avail. Re-organisation must begin with the higher control, and the organiser must be satisfied that every man in the concern makes his contribution to net profit.

Society of Dyers and Colourists

Annual Dinner at Manchester

THE 53rd annual dinner of the Society of Dyers and Colourists was held on February 26 at the Grand Hotel, Manchester. Among the guests were Mr. Frederick F. Flinn (Prime Warden of the Worshipful Company of Dyers, and president of the Society of Dyers and Colourists), Mr. Wilfred Turner (president of the Textile Institute), Sir Joseph Turner (Renter Warden of the Worshipful Company of Dyers), Mr. C. J. T. Cronshaw (representing the Manchester Section of the Institute of Chemistry), Mr. P. Caldwell (chairman of the British Cotton and Wool Dyers' Association), Professor F. M. Rowe, and Mr. C. M. Whittaker (British Colour Council).

Mr. WILFRED TURNER, in proposing the toast of "The Society of Dyers and Colourists," said that he regarded organisations such as the Society as the measure of an industry's fitness to function. A successful society proved by its very success that the industry was functioning well.

Mr. FREDERICK F. FLINN, in responding, said that the Society had not only contributed to the revival of the production of dyes, but also the discovery of new classes of dyes which were of great assistance in the development of the industry. Referring to the "Colour Index" edited by Professor F. M. Rowe, Mr. Flinn pointed out that the sales of this book now reached the total of 2,750 copies, and it still continued to be the standard book of reference on the subject of colour.

Sir JOSEPH TURNER presented the gold medal of the Worshipful Company of Dyers to Professor F. M. Rowe, and drew attention to the fact that this was the fourth time Professor Rowe had received this medal. Dr. C. H. Giles, Dr. R. L. M. Allen, Dr. W. G. Dangerfield, and Mr. Glyn Owen each received a diploma, having been associated with Professor Rowe in his research work.

Mr. C. GYSIN proposed the toast of "Our Guests," which was responded to by Mr. A. McCulloch.

Oil from Coal in South Africa

Fischer-Tropsch Plant to be Erected

FOLLOWING the acquisition of the South African rights in the Fischer-Tropsch oil from coal process by the Anglo-Transvaal Consolidated Investment Co., Ltd., plans are being made ready for the early erection in South Africa of a plant which will involve a large capital expenditure. British manufacturers are busy preparing tenders for the plant which will be required. This will be the first Fischer-Tropsch petrol plant in the British Empire. The decision of the company to adopt this process for the synthetic production of petrol as the only applicable one in South Africa was the result of a careful investigation of the operation of the plant at work at Oberhausen-Holten in Germany.

There are already five petrol works of this kind operating in Germany, and five further plants in course of erection. The total output of these works will amount to over 150,000,000 gal. of petrol per annum. The firm of Kuhlmann, the foremost chemical manufacturing concern in France, has also nearly completed the erection of a Fischer-Tropsch plant. The Mitsui Company has acquired the Japanese rights and a plant is now in course of erection in Japan. The Australian Government is studying the application of the process, and private enterprise is going ahead with the examination in Germany of the technical and commercial questions involved.

MEASURES of protection in case of air raids were discussed by Lt.-Col. W. G. MacGeorge, of the Home Office, in an address before the Notts and Derby Section of the British Association of Chemists, at Derby, on February 26. Lt.-Col. A. R. Laurie, assistant director of medical services for the 2nd Aircraft Division, who presided, advocated the appointment of a competent authority in every town.

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FOR the first time in nearly 20 years the Union Government is amending its excise rules for the manufacture of liquor specially in order to encourage the making of motor spirit and fuel oil in South Africa. This happened previously in 1917, when the production of Natalite and cane spirit was increased. As a result of the present step, it is expected that several new types of motor fuel will be placed on the South African market, made almost exclusively from ingredients produced in the country. Absolute alcohol up to about 72.5 per cent. is the main ingredient. In one blend it is present to the extent of 72.5 per cent., with 22.5 per cent. of benzol, distilled from coal by the Iron and Steel Corporation, Pretoria, and 5 per cent. acetone. Another type consists of 60 per cent. absolute alcohol, 35 per cent. benzol, and 5 per cent. petrol.

Personal Notes

MR. GEORGE ALFRED HARVEY, founder of G. A. Harvey and Co. (London), Ltd., sheet metal and steel plate workers, died on February 25, of heart failure. Mr. Harvey, who was 84 years of age, and lived at Preston Park, Brighton, was chairman of the firm until his death. He founded the undertaking in 1874 in a small shed at Lewisham, where, with the assistance of one boy, he carried on the business of a zinc worker. By 1894, the range of the firm's activities had increased to such an extent that the galvanising and tank-making departments were removed to new premises at Greenwich. Both the Lewisham and Greenwich works were eventually found to be inadequate and, in 1913, the firm moved to the site of the present works at Woolwich Road. Since that time, developments have been even more rapid, until to-day the works cover 40 acres and employ 2,000 people. After a memorial service at St. Alfege's Church, Greenwich, cremation took place at Golders Green.

The late Mr. G. A. Harvey

SIR HARRY MCGOWAN, chairman and managing director of Imperial Chemical Industries, Ltd., who was raised to the peerage on February 1, has assumed the title of Baron McGowan, of Ardeer, in the County of Ayr.

DR. A. C. CHIBNALL, who holds a post at the Imperial College, Royal College of Science, South Kensington, has now received the title of Professor of Biochemistry in the University of London.

MR. P. A. E. RICHARDS, F.I.C., F.C.S., of Putney, late public analyst to the Boroughs of Westminster and Hammersmith, and of the Royal Dental Hospital, left estate valued £27,942, with net personalty £27,875.

DR. FRANK BRIERS, head of the chemistry department at Wigan Mining Technical College, has been appointed to succeed Mr. J. Yates, head of the chemistry department at Derby Technical College.

MR. ADRIAN LUMLEY, superintendent of Torry Research Station, Aberdeen, who has been transferred to the Food (Defence Plans) Department in London, has been presented with a silver cigarette box and an album on behalf of his colleagues at Torry.

MR. HENRY R. BERINGER, who has died at Redruth, Cornwall, was for many years lecturer in mineralogy at the Camborne School of Mines, and more recently he was associated with Mr. A. F. H. Stephens as an assayer and analytical chemist.

MR. FRANK EASTMAN, chairman of J. Pullar and Sons, Ltd., Perth, and vice-chairman of Associated Dyers and Cleaners, Ltd., London, died on February 27, at the age of 61. He was one of the greatest technical experts in the dyeing and cleaning industry.

Chemical Notes from Foreign Sources

Finland

SULPHURYL CHLORIDE IN AQUEOUS SOLUTION has been giving encouraging results in tests for green fodder preservation.

Japan

BORIC ACID IS NOW MADE in Japan by Ch. Takeda and Co., and Shiono Koryo K.K.

ANTHRAQUINONE IS NOW PRODUCED by the Tobo Chemical Works at the rate of 2 tons per month.

A PLANT FOR MAGNESIUM MANUFACTURE, with a daily production capacity of 10 tons, is under construction at Sasaku (province of Toyama) by Nippon Magnesium K.K.

AN ANTIMONY REFINING PLANT IS TO BE CONSTRUCTED at Amagasaki, in the province of Hyogo, by the Japanese Antimony Mining Co. (Nippon Antimony Kogyo K.K.), who previously exported their ore to England.

SULPHURIC ACID IS TO BE MANUFACTURED by the Showa Mining Co., using the low grade ores of the Wakayama district, which have hitherto not been worked. The initial capacity of the new plant is to be over 500 tons of acid a month.

THE FORMOSA SALT CO. is planning an increase in its range of manufactures, to include magnesium, bromine and potash compounds. Production of salt in Formosa (now 50 to 60,000 tons per annum) is also to be tripled. A substantial interest in the concern has been acquired by the Japanese Soda Co.

A NEW PROCESS FOR THE MANUFACTURE OF AMMONIUM SULPHATE has been developed by Professor Matsui, of Tokyo Imperial University. This process has not so far been used commercially, but the Taiyo Mining Co., of Formosa, have just ordered the necessary plant and will commence production as soon as possible.

Italy

A LARGE ASBESTOS FACTORY operating a new process is shortly to be built in Turin.

Roumania

THE CARBON BLACK FACTORY of the Sonametan concern at Medias is to be enlarged, following large contracts from foreign rubber manufacturers.

Czechoslovakia

SEVERAL CO-OPERATIVE ASSOCIATIONS for bone utilisation have been formed recently in different parts of the country.

OXALIC ACID MANUFACTURE has now been taken up by the Aussig Verein which has entered the international convention regulating export prices and quotas.

THE RECENTLY MOOTED PLAN for producing synthetic rubber from alcohol by a Russian process is now understood to have been abandoned owing to the high cost of raw materials.

Germany

BODEN- UND WERKSTOFF-FORSCHUNGSGESELLSCHAFT HESSEN-NASSAU m.b.H., has been formed in Frankfort-on-Main, with a capital of 100,000 marks, with the main object of surveying the natural resources of Hesse and of carrying out research work in connection with developments of new materials. The majority of the shares are to be taken up by the State of Hessen and the Polytechnic Society, the balance to be shared equally among a number of leading industrial concerns, including the I. G. Farbenindustrie, the Gold- und Silber-Scheideanstalt, E. Merck, the Metallgesellschaft A.-G., and the Lurgi-Apparatebaugesellschaft m.b.H.

British Industries Fair

One of the Most Successful

THE British Industries Fair, which closed on February 26,, was one of the most successful on record. In size it was the largest yet held; and as regards the quality and range of goods exhibited, it may fairly be claimed that it was better than any of its predecessors. According to Captain Euan Wallace, Minister for Overseas Trade, the majority of exhibitors seem to have been wholly satisfied with the results of their participation. In many trades the volume of business transacted, both on home and overseas account, exceeded the most sanguine expectations.

The Federation of British Industries states that it is many years since it has found such an atmosphere of general satisfaction as was the case at the close of the 1937 Fair. Almost without exception members of the Federation report not only good business done and valuable new connections established, but in many cases records have been attained, easily topping the excellent results of the 1936 Fair. At its own bureau at Olympia it had a very large number of inquiries, rather above the average in quantity and variety of goods required. Inquiries for agencies also covered a wide range of countries and commodities were all well up to the average. The principal countries affected were the Dominions, Scandinavia, France, South America and Poland.

On February 25 the members of the Dyestuffs Industry Development Committee lunched at Olympia and visited the chemical section of the Fair.

Paint Grinding Machinery

Importance of Perfect Wetting Prior to Grinding

MR. G. R. MCFARLANE gave an address on "Paint Machinery and Its Application to Grinding" at the February meeting of the Manchester Section of the Oil and Colour Chemists Association. He contended that the paint mill effected a reduction in particle size of the pigments and consequently the oil absorption of the pigment had a definite bearing on the grinding problem. Hence, the work of paint manufacture was brought down to two main operations, *i.e.,* reduction of the particle size, and the attainment of complete oil absorption by the pigments or "perfect wetting."

Discussing some of the problems by which grinding and wetting was achieved, Mr. McFarlane first of all dealt with roller mills. He said it must be remembered that the pigment depended entirely upon the medium to carry it over the mill, and, in turn, the output of the mill depended on the capability of the medium to grip the roll. It followed, therefore, that the better the pigment and medium were pre-mixed, the better would be the performance of the mill.

Mixing may be termed "preliminary wetting." Dealing first of all with pastes there are only three machines worth consideration: (a) the edge runner mill, (b) the horizontal mixer, and (c) the revolving change pan mixer. The edge runner holds the blue ribbon for quality of mix as it has a definite rubbing action and will break up all coarse aggregates. It will deal equally well with any size of charge up to approximately a ton, its economy of working naturally increasing with the size of the machine. In addition, it is completely self-discharging, has a rapid mixing action and is easy to clean.

Mixing at liquid consistency, or dilution from paste to liquid, presents a very much simpler problem than paste mixing, and the plant does not have to be designed with the same degree of robustness. There are dozens of different mixers on the market for this purpose, but they nearly all employ the same principle of creating a "vortex" in a vertical container by means of rapidly revolving propeller blades or the like. Sizes range from five gallons to 200 gallons, and most makers allow for interchangeable containers. Reduction from paste to liquid is attained in ten minutes.

For many years the cone mill was looked upon as the mill *par excellence* for fine grinding, but with the advent of the roller mill, made as a precision machine, instead of the old-fashioned mangle, the cone mill had to take a back seat on account of its very small output. It is, of course, still used for fine grinding, but only for small batches or laboratory work. The best known of the roller mills, and one which covers by far the widest range of materials with which it will deal, is the triple roller mill, which has been in general use throughout the paint and ink trade for over half a century. In the triple roll mill experiment had revealed that a differential speed between the rolls of 15/20 to 1 gave a very fine finish to a liquid paint, but, being fed directly from a hopper, the mill was very selective; in other words, it was inclined to take the finer and better wetted products and leave the coarse particles and unwetted aggregates behind in the hopper. Consequently, its use was restricted to finishing unless the high differential was dropped, when it became a general utility mill capable of handling a wide range of materials. This type of mill was manufactured to-day with a number of gear ratios.

Industrial Management

Workmen No Longer Treated as Chattels

MR. R. LLOYD-ROBERTS, chief labour officer of Imperial Chemical Industries, Ltd., spoke at an industrial management conference at Glasgow on February 17. Speaking on the theme "Treat a man as a man, and not as a chattel," he said that an employee should not be offered a job as if a favour were being bestowed upon him, but should be made to feel that he was a welcome contribution to a common cause. The habit of paying workmen by the hour was one of the most potently demoralising features of industrial management. It emphasised the insecurity of the worker's position and entirely failed to convey the slightest idea of any form of partnership. He made a strong plea that wherever possible wages should be stabilised on a weekly basis. The old idea of business was to make as much profit as possible as quickly as possible, and every cost was cut to the bone to achieve that end.

Now the investor was slowly coming to the view that, subject to his getting a modest return, those actually engaged in the industry should receive generous treatment. He was realising that this was one way of protecting his investment and the reliability of the return. Confidence between the workers and the management was essential to good industrial relations. There should be provision for properly elected representatives of the workers meeting representatives of the management regularly. Market problems, handicaps, and plant alterations, should be explained The old-fashioned idea that all a firm's affairs were highly confidential and must not be entrusted to the man who worked with his hands must be broken down.

Irish Free State Imports

Chemical Statistics for January, 1937

IMPORTS of chemicals, drugs, etc., into the Irish Free State during January, 1937, show increases in value as compared with the corresponding month last year; the following being the principal figures:—Acids, £2,296 (against £1,868 in 1936); calcium carbide, £1,653 (£336); chemical food preservatives, etc., £1,359 (£5,825); disinfectants, etc., £2,490 (£1,056); potassium compounds, £1,073 (£835); caustic soda, £1,556 (£1,395); other sodium compounds, £9,516 (£7,528); other chemical manufactures, £17,023 (£11,269); perfumery, cosmetics, etc., £1,423 (£2,075); medicinal preparations, £22,200 (£21,066); dyestuffs, £3,784 (£2,914); tanning materials, £5,850 (£3,282); paints, distempers and enamels, £2,373 (£2,360); white lead, £2,006 (£2,512); ochre and earth colours, £879 (£596); other descriptions, £5,962 (£4,863). Total, £82,071 (against £71,027 last year).

From Week to Week

THE INTERNATIONAL NICKEL CO. has purchased the property of the Horseshoe Lake Mining Co. at Ormiston, Saskatchewan.

THE BRITISH CHEMICAL AND DYESTUFFS TRADERS' ASSOCIATION will hold its 14th annual meeting at the Waldorf Hotel, London, on April 14. Nominations and notices of special business should reach the secretary not later than April 1.

MR. MALDWYN JONES, of the rubber section of Imperial Chemical Industries, read a paper on "The Correct Use of Anti-oxidants" at a joint meeting of the Leicester Literary and Philosophical Society (Chemistry Section), and the Leicester section of the Institution of the Rubber Industry on February 24, at the Technical College. After a brief outline of the history of rubber and the discovery of anti-oxidants, the lecturer went on to describe the functions of these compounds, and some of the difficulties encountered in their use. Mr. T. R. Garner presided.

A SCHEME FOR THE REORGANISATION of the cotton and artificial silk piece dyeing industry was outlined by Mr. George Douglas, chairman and managing director of the Bradford Dyers' Association, at the association's annual meeting on February 26. He said that the plan was to deal with the redundancy of plant in the industry, and of buying out willing sellers until a capacity more in accord with the volume of business available was reached. The cost was to be met by a levy on films remaining in the trade. The committee were seeking Government support as the necessary money could not be provided except by statutory authority.

UNLESS SATISFACTORY METHODS of treatment and disposal of sewage and industrial effluents are more widely adopted there will be considerable difficulty in providing the large volumes of water of good quality necessary for domestic, agricultural, and industrial purposes, states the annual report of the Water Pollution Research Board. On the one hand, the demand for water of the highest chemical and bacteriological quality is increasing; on the other hand, industrial developments have caused increases in the quantities of polluting effluents discharged into rivers in many parts of the country.

CHEMICAL RESEARCH in its relation to industry was the subject of an address for the Dundee Rotary Club by Dr. Alex. McKenzie, professor of chemistry in University College, Dundee. He said that the progress of technical chemistry since 1919 had been remarkable. Manufacturers began to understand that pure research or applied research could help them in their industries. He referred particularly to the success which had attended the British Cotton Industry Research Association. What worried him, he said, was that the jute industry of Dundee had not come into line with the Department of Scientific and Industrial Research. He hoped that the time would come when the industrialists in jute would get together and have some co-operative research on the same lines as the Manchester people.

A LUMINOUS PAINT OF SWEDISH INVENTION, which is claimed to be considerably cheaper than other products yet produced, is to be placed on the market. This so-called "Swedish radium light" is a self-luminous radioactive paint, which is claimed to glow with almost the brightness of a Neon light.

THE MEXICAN EAGLE OIL CO. has lost its case in the Supreme Court of Mexico which involved claims for new concessions dealing with more than 2,000,000 acres. The company's shares have recently been adversely affected by fears that the Mexican Government might nationalise foreign oil companies in the country.

ONE HUNDRED M.P.s and scientists met in a committee room at the House of Commons on March 2 to hear an explanation by members of the Cambridge Scientists Anti-War Group of their experiments on the recommendations of the Home Office Air Raids Precautions Department. Mr. A. Creech Jones, M.P., presided.

THE LECTURE on "Gas Defence from the Point of View of the Chemist," which Mr. J. Davidson Pratt delivered before the London and South-Eastern Counties Section of the Institute of Chemistry on January 20, and before the Glasgow and West of Scotland Section of the Institute on January 22, has been published in booklet form by the Institute of Chemistry.

THE NATIONAL FEDERATION of Associated Paint, Colour and Varnish Manufacturers of the United Kingdom announces that at a meeting of the leading paint, varnish and lacquer manufacturers just held in London it was decided, in view of the substantial rise in the cost of raw materials used in the manufacture of their products, that manufacturers would increase their selling prices forthwith.

WITH THE CO-OPERATION of the research departments of National Oil Refineries, the Mond Nickel Co., and the engineering departments of Swansea University College and Cardiff University College, an exhibition of scientific research methods and apparatus as applied to industry was arranged by Professor F. Bacon, president of the South Wales Institute of Engineers in connection with the annual meeting of the Institute at Swansea on March 2.

THREE NEW PROSPECTING LICENCES under the Petroleum (Production) Act, 1934, and the Petroleum (Production) Regulations, 1935, have been issued by the Board of Trade to the D'Arcy Exploration Co., Ltd., the development company of the Anglo-Iranian Oil Co. The licences cover a total area of approximately 535 square miles in Derbyshire, Cheshire, Staffordshire, Wiltshire and Hampshire. The Board of Trade has also granted an application by the same company for the extension of two licensed areas previously granted to it to embrace additional areas aggregating 103 square miles in Dorsetshire, Hampshire and Surrey.

Company News

British Xylonite.—The accounts for 1936 show a profit of £32,796 (£40,475); adding £66,109 brought in, makes £98,905. A final dividend of 5 per cent. on ordinary shares is declared, making 7½ per cent., less tax (9 per cent.); forward, £74,124. Meeting, Hale End, E.4, March 12, at 11 a.m.

Salt Union.—Maintenance of the 1936 dividend at 9 per cent., less tax, is announced. The transfer to contingencies account is reduced by £10,000 to £20,000, and some £14,000, against £15,892, is carried forward. Authorised and issued capital is £1,400,000 divided into £600,000 in £1 preference shares and £800,000 in £1 ordinary shares.

Bradford Dyers' Association.—The full accounts for 1936 show that, after charging £153,605 for depreciation and crediting surplus tax provision, profit is £38,047, against loss of £8,197; debenture interest takes £58,150, leaving net loss £20,102, (£66,347): after crediting £10,606 brought in and again transferring £50,000 from reserve, a credit of £40,504 is carried forward.

Paripan.—The net trading profit for 1936, after directors' fees, was £10,115, against £9,710, plus £7,036 brought in, making £17,151. To tax reserve, £2,182 (£1,678); preference dividend, £1,258; interim of 5 per cent. on ordinary, £1,465; final on ordinary of 15 per cent., making 20 per cent. (same), £4,396; directors' additional remuneration £51 (£330); to bad debts reserve, £1,000 (nil); to general reserve, £1,020 (nil); forward, £5,779. The directors recommend a change in article 67 under which board is entitled to 25 per cent. of surplus profits after 20 per cent. ordinary dividend; the directors now recommend that additional remuneration be reduced to 6¼ per cent. of such surplus profits. Meeting, Sherwood House, Piccadilly Circus, W.1, March 15, at 12 noon.

Monsanto Chemicals.—The net profit for 1936 is £115,721, against £111,066; adding £97,827 brought in and £1,060 balance of provision for contingencies not now required, makes £214,607; to preference dividends for 1936, less tax, £16,844; forward, £197,764. During the year number of extensions and improvements to plant and equipment has been undertaken and completed. These comprise installations for nine new products and improved installations for two old products, as well as extensions to general service equipment. Capital additions for the year amount to £68,624.

New Companies Registered

Escos Chemicals, Ltd., 91-93 Southwark Street, S.E.1.—Registered February 22. Nominal capital £1,000. Manufacturers of and dealers in chemicals, pharmaceutical, cosmetic and perfumery goods and products, etc. Directors: Wm. E. Davis, M. Frommer, and D. Katz.

J. W. Stevens (Morden), Ltd., India House, 84 Leadenhall Street, E.C.3.—Registered February 26. Nominal capital, £100. Glue, gelatine and chemical manure manufacturers and merchants, bone crushers and merchants, grease manufacturers and merchants, etc. Directors: George W. Hawkins and J. E. R. Rochester.

The International Colliery Co. (Blaengarw), Ltd.—Registered February 20. Nominal capital £70,000. Colliery proprietors, manufacturers of and dealers in coal, coke, peat, lignite, briquettes and fuel of all kinds, miners, smelters, ironmasters, manufacturers of chemicals and manures, gas makers, etc. Subscribers: R. J. Spearman, 29 Upper Kincraig Street, Cardiff, and E. F. Pitman.

Weekly Prices of British Chemical Products

THE only price changes in the London chemical market this week have been an advance of 1d. per lb. in the price of tartaric acid and a rise of 5s. per cwt. in potassium bitartrate 99/100%, which is now 84s. per cwt. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

MANCHESTER.—Trading conditions on the Manchester chemical market have been moderately active so far as fresh business in most of the heavy chemicals is concerned, with transactions covering early deliveries as well as deliveries over the next few months. Traders still report that there is little ground for complaint regarding the way in which delivery specifications are circulating against old contracts, the quantities being called for by most of the using industries, including the cotton and woollen textile industries, being on a fairly good scale. Prices are mostly on a steady basis, with distinct strength in evidence in the case those chemical products associated with the non-ferrous metals. In the by-products market the feature of the past week has been a further stiffening of prices of both crude carbolic and cresylic acid and available supplies of these are being readily absorbed.

GLASGOW.—There has been an improved demand for chemicals for home trade during the week, and also rather more inquiry for export. Prices generally continue very firm, with considerable advances in several materials. Lead, copper and zinc products are all much dearer in sympathy with the metals. Cream of tartar is up £5 per ton, and tartaric acid about 1d. per lb., on account of the scarcity and high price of raw materials. A brisk demand continues for all lighter materials of the coal tar products group, but there has been only a limited volume of business done on account of shortage of supplies. In cresylic and carbolic acids producers are particularly busy, but almost entirely with deliveries against previous contracts which in some cases run into many months ahead. A few spot lots of these products have been offered at the advanced prices indicated. Creosote is very steady and large quantities are moving in this district. There appears to be a firmer tone generally about the pitch market, but so far no fresh business of any moment is reported.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACID, ACETIC.—Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £30 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, in 1-cwt. bags, £28; powdered, in 1-cwt. bags, £29.

ACID, CHROMIC.—9¼d. per lb., less 2½%; d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 11¾d. SCOTLAND: B.P. crystals, 1s. per lb., less 5%.

ACID, FORMIC.—85%, in carboys, ton lots, £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works.

ACID, OXALIC.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

ACID, SULPHURIC.—168° Tw., £4 5s. to £4 15s. per ton; 140° Tw., arsenic-free, £2 15s. to £3 5s.; 140° Tw., arsenious, £2 10s.

ACID, TARTARIC.—1s. 0⅝d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 11¾d. to 1s. per lb.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 2s. 6d. per ton; lump, £9 12s. 6d.

ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £16 10s. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—£55 10s. per ton.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines SCOTLAND: White powdered. £17 ex store. MANCHESTER: White powdered Cornish, £18, ex store.

BARIUM CHLORIDE.—£10 per ton. GLASGOW: £11 5s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%. £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9.

BORAX COMMERCIAL.—Granulated, £14 10s. per ton; crystal £15 10s.; powdered, £16; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £14 10s. per ton in 1-cwt. bags, carriage paid.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. GLASGOW: 70/75% solid, £5 10s. per ton net ex store.

CHROMETAN.—Crystals. 2⅝d. per lb.; liquor, £19 10s. per ton d/d

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. GLASGOW: £4 4s. net.

FORMALDEHYDE.—£22 10s. per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

IODINE.—Resublimed B.P., 5s. 1d. per lb.

LEAD ACETATE.—LONDON: White, £35 10s. per ton; brown, £35. GLASGOW: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £37 10s.; brown, £36.

LEAD NITRATE.—£39 per ton.

LEAD, RED.—SCOTLAND: £44 10s. per ton less 2½%, carriage paid, for 2-ton lots.

LEAD (WHITE SUGAR OF).—GLASGOW: £36 10s. per ton net, ex store.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORINE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PARAFFIN WAX.—SCOTLAND: 3⅝d. per lb.

PHENOL.—6⅝d. to 7¼d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £40.

POTASSIUM BICHROMATE.—SCOTLAND: 5d. per lb., less 5%, carriage paid.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £38 per ton.

POTASSIUM IODIDE.—B.P. 4s. 3d. per lb.

POTASSIUM NITRATE.—£27 per ton. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10¾d. to 11½d.

POTASSIUM PRUSSATE.—6½d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d. to 6¾d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. GLASGOW: Large crystals, in casks, £38.

SALT CAKE.—Unground, spot, £3 16s. 6d. per ton.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £12 15s. per ton in 1 cwt. kegs, £11 per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. MANCHESTER: 4d. per lb. GLASGOW: 4d., less 5% carriage paid.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£26 10s. to £30 per ton. GLASGOW: £1 10s. per cwt.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHATE.—Commercial, 2 ton lots d/d, £10 5s. per ton; photographic, £14 5s. MANCHESTER: Commercial, £10; photographic, £14 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £7 15s. per ton for 6-ton lots d/d.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, 9¾d. per lb. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—4d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 4½d.
SODIUM SILICATE.—£9 10s. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals, spot, £13 5s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHATE OF COPPER.—£20 per ton, less 2%, in casks. MANCHESTER: £22 10s. per ton f.o.b. SCOTLAND: £25 10s. per ton less 5%, Liverpool, in casks.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
ZINC SULPHATE.—Crystals, £9 per ton, f.o.r., in bags.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Neutral quality, basis 20.6 per cent. nitrogen, delivered in 6-ton lots to farmer's nearest station, March to June, £7 5s. per ton.

CALCIUM CYANAMIDE.—March, £7 3s. 9d. per ton; April to June, £7 5s. per ton, carriage paid to any railway station in Great Britain in lots of four tons and over.

NITRO-CHALK.—£7 5s. per ton for delivery to end of June.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery up to end of June.

AMMONIUM PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton for delivery up to end of June, delivered in 6-ton lots to farmer's nearest station.

Coal Tar Products

ACID, CRESYLIC.—97/99%, 3s. 11d. to 4s. per gal.; 99/100%, 4s. to 4s. 6d. per gal., according to specification; pale 99%, 4s. 1d. to 4s. 2d.; dark, 3s. 4d. to 3s. 6d. GLASGOW: Pale, 99/100%, 4s. to 4s. 6d. per gal.; pale, 97/99%, 3s. 6d. to 4s.; dark, 97/99%, 3s. 3d. to 3s. 6d.; high boiling acids, 2s. 3d. to 2s. 6d. American spicfication, 3s. 6d. to 4s. MANCHESTER: Pale, 99/100%, 4s. 2d.
ACID, CARBOLIC.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's, 2s. 9d. to 1s. 11d. per gal. MANCHESTER: Crystals, 6¾d. to 7s. per lb.; crude, 3s. 2d. per gal. GLASGOW: Crude, 60's, 3s. to 3s. 6d. per gal.; distilled, 60's, 3s. 6d. to 4s.
BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. LONDON: Motor, 1s. 3½d. GLASGOW: Crude, 9½d. to 10½d. per gal.; motor, 1s. 3d. to 1s. 4d.
CREOSOTE.—B.S.I. Specification standard, 5¾d. to 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North: 5d. London. MANCHESTER: 5¼d. to 6d. GLASGOW: B.S.I. Specification 5¼d. to 5¾d. per gal.; washed oil, 4¾d. to 5¼d.; lower sp. gr. oils, 5d. to 5¼d.
NAPHTHA.—Solvent, 90/160%, 1s. 6½d. to 1s. 7½d. per gal.; 95/160%, 1s. 7d.; 90/190%, 1s. 1d. to 1s. 2½d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW: Crude, 6d. to 6¾d. per gal.; 90% 160, 1s. 4d. to 1s. 5d. 90% 190, 1s. to 1s. 1d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £11 10s. to £12 10s. per ton; purified crystals, £18 to £20 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free).
PYRIDINE.—90/140%, 9s. to 9s. 6d. per gal.; 90/180, 2s. 6d. to 3s. GLASGOW: 90% 140, 9s. to 10s. per gal.; 90% 160, 7s. to 8s.; 90% 180, 2s. 6d.
TOLUOLE.—90%, 2s. per gal.; pure, 2s. 5d. GLASGOW: 90%, 120, 1s. 10d. to 1s. 11d. per gal.
PITCH.—Medium, soft, 35s. per ton, in bulk at makers' works. MANCHESTER: 34s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 28s. 6d. to 35s. per ton; in bulk for home trade, 32s. 6d.
XYLOL.—Commercial, 2s. 1d. per gal.; pure, 2s. 3d. GLASGOW: Commercial, 1s. 11d. to 2s. per gal.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £9 per ton; grey, £10 10s. to £11. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.
CHARCOAL.—£5 5s. to £10 per ton, according to grade and locality.
METHYL ACETONE.—40-50%, £43 to £46 per ton.
WOOD CREOSOTE.—Unrefined 6d. to 9d. per gal., according to boiling range.
WOOD, NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 3d. per gal.; solvent, 3s. 3d. to 3s. 6d. per gal.
WOOD TAR.—£2 to £3 per ton.

Latest Oil Prices

LONDON, March 3.—LINSEED OIL was firm. Spot, £30 5s. per ton (small quantities); March and April, £27 17s. 6d.; May-Aug., £28; Sept.-Dec., £28 2s. 6d., naked. SOYA BEAN OIL was steady. Oriental (bulk), afloat, Rotterdam, £27 5s. per ton. RAPE OIL was quiet. Crude, extracted, £35 10s. per ton; technical refined, £36 10s., nakeed, ex wharf. COTTON OIL was steady. Egyptian crude, £29 5s. per ton; refined common edible, £33; deodorised, £35, naked, ex mill (small lots £1 10s. extra). TURPENTINE was unchanged. American spot, 40s. 6d. per cwt.

Chemical and Allied Stocks and Shares

SHARES of chemical and allied companies have been more active than for some time past. Turner and Newall are 106s. 9d. at the time of writing, compared with 103s. a week ago, and British Oxygen have improveed. It is being pointed out in the market that although yields offered by these shares is small there appear good grounds for expecting increased dividend payments. Imperial Chemical have improved 1s. 6d. to 40s., and Distillers are now 109s. 9d., which compares with 104s. 3d. a week ago, and with 114s. 6d. a fortnight ago. Although the market is still rather less hopeful of a bonus this year there are reasonable prospects of a larger dividend. For the previous year 20 per cent. was paid, but over 27 per cent. was earned on the ordinary capital. Salt Union have been weak, there having been a reaction from 45s. 6d. to 38s. 9d. on the rather lower profits shown for the year, which came as a surprise to the market.

Triplex Safety Glass were in demand at higher prices, partly owing to attention drawn to the possibility of plastic mouldings being employed on a considerable scale by motor car manufacturers as time proceeds. One of the company's subsidiaries is engaged in the plastics industry. British Industrial Plastics 2s. ordinary shares were again active around 3s. 1½d. British Glues were lower at 9s. 9d., but the price did not appear to have been tested by much business. British Drug Houses were steady on confidence that the dividend will again be 5 per cent. British Plaster Board were in demand on the view that despite the larger capital ranking there will probably be little difficulty in maintaining the dividend.

Cooper, McDougall and Robertson came in for increased attention and have changed hands up to the higher level of 38s. 3d. on the hope that the forthcoming results may show a moderately larger dividend. The company has a strong balance sheet position and the recovery in the Argentine and other agricultural countries may result in gradual improvement in demand for its products. Fison, Packard and Prentice were steady around 38s. 9d. "middle"; business was recorded up to 39s. 3d. Imperial Smelting have not held best prices despite the rise in the price of zinc, which, if maintained should be of benefit to the company's business. Canning Town Glass and United Glass Bottle were again steady, awaiting the dividend announcements. Greeff-Chemicals Holdings 5s. shares, issued at 7s. 6d. last year, have been steady and are again quoted at 10s. United Water Softeners changed hands up to 36s. at Birmingham, following declaration of the increased dividend of 8 per cent.

Boots Pure Drug were a more buoyant market, there having been a recovery on the week from 54s. 3d. to 56s. 10½d. Timothy Whites and Taylors were steady awaiting the interim dividend, and Sangers were steady on the belief that the dividend will at least be maintained.

Pinchin Johnson have recovered strongly in advance of the dividend declaration, and Indestructible Paint and International Paint were in larger demand pending the past year's results. Associated Portland Cement was another share to show favourable recovery in price. Dorman Long and Consett Iron were steady among iron and steel shares. Bradford Dyers, Calico Printers and other textile shares were steadier and Courtaulds remained firm pending the meeting which is being awaited with considerable interest for any review that may be given of the outlook for the rayon trade.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

PRICE AND PATRICK, LTD., Birmingham, manufacturers of fertilisers, etc. (M., 6/3/37.) Feb. 22, series of £5,000 (not ex.) debentures, present issue £4,000; general charge. *£3,012. January 21, 1936.

UNIVERSAL WATER SOFTENING CO., LTD., London, W.C. (M., 6/3/37.) Feb. 18, £250 debenture, to W. H. Golding, Harrow; general charge.

VENEZUELAN EASTERN OILFIELDS, LTD. (incorporated in Canada). (M., 6/3/37.) Feb. 18, £2,500 debenture, to Miss M. Fellows, Brigton; general charge.

Satisfaction

BARKER BROTHERS (SIMPSON CLOUGH), LTD., Heywood, bleachers, etc. (M.S., 6/3/37.) Satisfaction February 20, of mortgage registered January 26, 1937, to extent of £137 11s. 6d.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

PLIMSOLINE PRODUCTS, LTD., 140 Falkland Road, Hornsey, manufacturing chemists. (C.C., 6/3/37.) £14 18s. 6d. January 21, and £67 9s. 10d. January 26.

Receiverships

M. H. WILSON AND SONS, LTD., manufacturers of chemical manures, etc., 28 Old Market, Wisbech. (R., 6/3/37.) W. F. Whiting, of Norwich and Wisbech, was appointed receiver and manager on February 18, 1937, under powers contained in debentures dated February 24, 1923.

Winding-up Petition

PLIMSOLINE PRODUCTS, LTD. (W.U.P., 6/3/37.) A petition for the winding-up of this company by the Edmonton County Court was, on February 17, presented by John Copeman and Sons, Ltd., of Davey Place, Norwich, and is to be heard at the Court House, Upper Edmonton, on April 8.

Forthcoming Events

LONDON.

Mar. 8.—Institution of the Rubber Industry. (London Section). "Activating Influence of Various Metallic Oxides on Vulcanisation in the Presence of Accelerators." J. Westhead. "Ageing of Vulcanised Rubber in Steam." B. A. Bleiweis. 7.30 p.m. British Empire Club, 12 St. James's Square, London.

Mar. 8.—Royal Society of Arts. Cantor Lecture. "The Physics and Chemistry of Paintings (II)." F. Ian G. Rawlins. 8 p.m. John Street, Adelphi, London.

Mar. 9.—Society of Chemical Industry (Road and Building Materials Group). "Some Plastering Problems in Building." B. Bakewell. 8 p.m. Rooms of the Chemical Society, Burlington House, Piccadilly, London.

Mar. 9.—Pharmaceutical Society of Great Britain. "The Uses of Stainless Steel for Pharmaceutical Apparatus." W. H. Hatfield. 8.30 p.m. 17 Bloomsbury Square, London.

Mar. 10.—Institute of Metals. Annual General Meeting. 10 a.m. Hall of the Institution of Mechanical Engineers, Storey's Gate, London. Annual Dinner. 7 p.m. Trocadero Restaurant, Piccadilly Circus, London.

Mar. 10.—Institute of Fuel. "Flue Type Boilers." A. F. Webber. 6 p.m. Rooms of the Chemical Society, Burlington House, Piccadilly, London.

Mar. 10.—Society of Chemical Industry (Food Group). Short Original Papers. 8 p.m. Institute of Chemistry, 30 Russell Square, London.

Mar. 11.—Institute of Metals. Annual General Meeting (Continued). 10 a.m. Hall of the Institution of Mechanical Engineers, Storey's Gate, London.

Mar. 11.—Chemical Society. Ordinary Scientific Meeting. 8 p.m. Burlington House, Piccadilly, London.

Mar. 11.—Institute of the Plastics Industry. (London Section). "The Continuous Moulding of Thermo-setting Compounds." P. A. Delafield. British Industries House Club, Marble Arch, London.

Mar. 12.—Physical Society. Annual General Meeting. 5 p.m. Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London.

Mar. 12.—Institute of Vitreous Enamellers. (Southern Section). "Vitreous Enamelling in the Soviet Union." Compiled by J. H. Gray, from data received from The Trust of Municipal Equipment, Moscow. 8 p.m. British Industries House, Marble Arch, London.

BIRMINGHAM.

Mar. 8.—Chemical Society and Birmingham University Chemical Society. "Recent Developments in Surface Action." Professor E. K. Rideal. 5 p.m. Chemical Department, Edgbaston, Birmingham.

EDINBURGH.

Mar. 12.—Institute of Chemistry and Society of Chemical Industry (Edinburgh and East of Scotland Sections). "Some Fundamental Laws of Chemical Change." C. N. Hinshelwood. 7.30 p.m. North British Station Hotel, Princes Street, Edinburgh.

GLASGOW.

Mar. 9.—Institute of Metals (Scottish Section) and Institution of Engineers and Shipbuilders in Scotland. "Some Aspects of Metallic Corrosion." U. R. Evans. 7.30 p.m. Rooms of the Institution of Engineers and Shipbuilders, 39 Elmbank Crescent, Glasgow.

HULL.

Mar. 9.—Hull Chemical and Engineering Society. "Modern Steam Generation, with special reference to Industrial Factories." F. H. Preece. 7.45 p.m. Room 57, Municipal Technical College, Park Street, Hull.

LEEDS.

Mar. 8.—Society of Chemical Industry (Yorkshire Section). "Recent Advances in Water Softening and Conditioning." P. Hamer. 7.30 p.m. Chemical Lecture Theatre, The University, Leeds.

LIVERPOOL.

Mar. 11.—Institute of Chemistry. (Liverpool Section). "Leather." G. E. Knowles. 7.30 p.m. Constitutional Club, India Buildings, Water Street, Liverpool.

MANCHESTER.

Mar. 11.—Chemical Society. Original Papers. 7 p.m. Chemistry Lecture Theatre, The University, Manchester.

NEWCASTLE-UPON-TYNE.

Mar. 9.—Institute of Metals (North East Coast Section). Annual General Meeting. "Large Non-Ferrous Castings." J. E. Newson. 7.30 p.m. Electrical Engineering Lecture Theatre, Armstrong College, Newcastle-upon-Tyne.

SHEFFIELD.

Mar. 12.—Institute of Metals (Sheffield Section). Annual General Meeting. "Some Recent Researches on Wire-Drawing." Professor F. C. Thompson. 7.30 p.m. Non-Ferrous Section of the Applied Science Department, The University, St. George's Square, Sheffield.

STOKE-ON-TRENT.

Mar. 8.—Ceramic Society. (Pottery Section). "Lead and Silicosis—Works' Precautions." Dunbar F. W. Bishop. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

Books Received

Quantitative Analysis. By William Rieman and Jacob D. Neuss. London: McGraw-Hill Publishing Co., Ltd. Pp. 425. 18s.

Brass Pressings. London: The Copper Development Association. Pp. 69. Free on application to the Association.

New Practical Chemistry. By Newton Henry Black and James Bryant Conant. New York: The Macmillan Co. Pp. 621. 7s. 6d.

New Laboratory Experiments in Practical Chemistry. By Newton Henry Black. New York: The Macmillan Co. Pp. 193. 5s.

Structure and Molecular Forces in (a) Pure Liquids and (b) Solutions. A General Discussion of the Faraday Society. London: Gurney and Jackson. Pp. 282. 12s. 6d.

Chemical Principles—With Particular Application to Qualitative Analysis. By Professor John H. Yoe. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. Pp. 311. 13s. 6d.

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

PROCESS FOR THE PRODUCTION OF ACETYLENE by heating hydrocarbon gases for a short time.—Ruhrchemie A.-G. Aug. 19, 1935. 30919/35.

INHIBITION OF CRYSTALLISATION IN COAL-TAR DISTILLATES.—Armour and Co. Aug. 21, 1935. 11311/36.

PROCESS FOR THE PRODUCTION OF AN IMPROVED ADSORPTIVE REAGENT for the removal of odorous and otherwise objectionable gases and vapours from atmospheres and the product of such process.—Hygienic Research Proprietary, Ltd. Aug. 17, 1935. 18171/36.

PROCESS OF POLISHING A FORMALDEHYDE RESIN.—C. W. Kuehne. Aug. 17, 1935. 18836/36.

PROCESS FOR DRYING SUBSTANCES in the condition of sludge, and for evaporating solutions.—Metallges A.-G. Aug. 21, 1935. 19552/36.

PREPARATION OF CELLULOSE XANTHATE SOLUTIONS.—Brown Co. Aug. 20, 1935. 20550/36.

PROCESS FOR THE PRODUCTION of valuable higher molecular organic compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 21, 1935. 22013/36.

PROCESS OF HALOGENATING UNSATURATED ORGANIC COMPOUNDS by substitution.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 21, 1935. 22237/36.

MANUFACTURE OF DYESTUFFS.—Soc. of Chemical Industry in Basle. Aug. 17, 1935. 22597/36.

MANUFACTURE OF SYNTHETIC RUBBER and products of the isoprene type.—J. Eringer. Aug. 17, 1935. 22630/36.

MANUFACTURE AND PRODUCTION OF HIGH QUALITY LUBRICATING OILS.—I. G. Farbenindustrie. Aug. 17, 1935. 22634/36.

PROCESS FOR OBTAINING CELLULOSE.—F. C. Palazzo, C. Bouvier, G. Fouche and E. Seguin. Aug. 19, 1935. 22802/36.

MANUFACTURE OF VAT DYESTUFFS.—I. G. Farbenindustrie. Aug. 22, 1935. 23231/36.

PROCESS FOR EVAPORATING HYDROCHLORIC ACID WOOD SUGAR SOLUTIONS.—Naamlooze Vennootschap Internationale Suiker en Alcohol Compagnie International Sugar and Alcohol Co. Isaco. Aug. 22, 1935. 23273/36.

Specifications Accepted with Date of Application

COMPOSITIONS OF MATTER.—W. W. Triggs (E. I. du Pont de Nemours and Co.). May 9, 1935. 461,236.

MANUFACTURE OF POLYMERIC AMIDES.—W. W. Triggs (E. I. du Pont de Nemours and Co.). May 9, 1935. 461,237.

CATALYSIS.—W. W. Triggs (E. I. du Pont de Nemours and Co.). May 10, 1935. 461,127.

NATURAL OR ARTIFICIAL FIBROUS MATERIAL.—W. W. Groves (I. G. Farbenindustrie.) June 8, 1935. 461,179.

APPARATUS FOR THE SEPARATION OF SOLID OR LIQUID PARTICLES from gases, vapours, or smoke.—M. Zander. June 11, 1935. 461,180.

REMOVAL OF ORGANICALLY COMBINED SULPHUR FROM GASES.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie.) July 2, 1935. 461,001.

RECOVERY OF HYDROCYANIC ACID.—Rohm and Haas Co. March 9, 1935. 461,130.

PRODUCTION OF COLOURED PHOTOGRAPHIC PICTURES.—W. W. Groves (I. G. Farbenindustrie.) July 5, 1935. 461,006.

PROCESS FOR IMPROVING THE FASTNESS OF DYEINGS.—A. Carpmael (I. G. Farbenindustrie.) July 5, 1935. 461,181.

MANUFACTURE OF A BEVERAGE FROM WHEY.—H. Himmelsbach. Aug. 2, 1935. 461,184.

MANUFACTURE OF BASES DERIVED FROM α-AMINOPYRIDINE.—G. T. Morgan, and J. Stewart. Aug. 6, 1935. 461,185.

PROCESS FOR THE MANUFACTURE OF DERIVATIVES OF ORTHO-PHENYLENE-DIAMINES.—A. Carpmael (I. G. Farbenindustrie.) Aug. 7, 1935. 461,245.

MANUFACTURE OF HYDROXY-CARBOXYLIC ACIDS and of acid amides derived therefrom.—A. Carpmael (I. G. Farbenindustrie.) Aug. 8, 1935. 461,189.

PROCESS FOR THE MANUFACTURE OF ADDITION PRODUCTS OF ACETYLENE and its hydrocarbon substitution products.—A. Carpmael (I. G. Farbenindustrie.) Aug. 9, 1935. 461,080.

TREATMENT OF ALKALINE CYANIDE SOLUTIONS containing dissolved precious metals.—Merrill Co., L. D. Mills, T. B. Crowe, and J. C. Haun. Aug. 10, 1935. 461,252.

MANUFACTURE OF ALKYL HALIDES.—I. G. Farbenindustrie. Aug. 10, 1934. 461,140.

PRODUCTION OF MOTOR FUELS.—E. Solomon. Aug. 12, 1935. 461,321.

TREATMENT OF MINERAL SLURRY in the manufacture of cement or lime.—M. Vogel-Jorgensen. Aug. 12, 1935. 461,323.

MANUFACTURE OF COMPOUNDS OF THE AETIO-CHOLENONE or aetio-allo-cholenone series.—Soc. of Chemical Industry in Basle. June 18, 1935. 461,322.

PURIFICATION OF WATER.—F. P. Candy. Aug. 14, 1935. 461,196.

PROCESS FOR THE MANUFACTURE OF SAFRANINE DYESTUFFS.—I. G. Farbenindustrie. Aug. 14, 1935. (Addition to 431,708.) 461,267.

MANUFACTURE OF HALOGENATED COMPOUNDS.—R. P. Linstead, C. E. Dent, and Imperial Chemical Industries, Ltd. Aug. 14, 1935. 461,268.

PRODUCTION OF BAKED CEREAL PRODUCTS.—E. I. du Pont de Nemours and Co. Aug. 14, 1934. 461,269.

RESIN-FIBRE PRODUCTS.—Bakelite, Ltd. Aug. 22, 1934. 461,271.

RESIN-FIBRE COMPOSITIONS.—Bakelite, Ltd. Aug. 22, 1934. 461,272.

MANUFACTURE OF CALCIUM CYANAMIDE.—A.-G. Fur Stickstoff-Dunger. Aug. 14, 1934. 461,274.

WASHING AND CLEANSING.—I. G. Farbenindustrie. Aug. 14, 1934. 461,328.

PRODUCTION OF DISPERSIONS OF HALOGENOBUTADIENES.—E. I. du Pont de Nemours and Co. Aug. 23, 1934. 461,279.

MANUFACTURE OF POLYNUCLEAR CYCLIC OXYKETONES and esters thereof.—A. G. Bloxam (Soc. of Chemical Industry in Basle). Aug. 19, 1935. 461,335.

PRODUCTION OF COLLOIDAL DETERGENTS.—Electric Smelting and Aluminium Co. July 12, 1935. 461,013.

PROCESS OF EXTRACTING AND CONCENTRATING VITAMINES.—Aarhus Oliefabrik Aktieselskabet, and C. E. Christensen. Oct. 8, 1935. 461,202.

PROCESS FOR COLOURING PAPER.—A. G. Bloxam (Soc. of Chemical Industry in Basle.) Jan. 30, 1936. 461,042.

APPARATUS FOR RACKING EFFERVESCENT OR AERATED LIQUIDS.—Soc. Industrielle de Machines Modernes Automatiques. Aug. 24, 1935. 461,164.

PROCESS OF CONCENTRATING AQUEOUS RUBBER and like dispersions. Metallges, A.-G. April 3, 1935. 461,216.

PROCESS FOR DE-INKING PAPER printed with oxidizable inks.—P. R. Hines. Sept. 30, 1935. 461,219.

PROCESS FOR OBTAINING 1.1.2 TRICHLORETHANE.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. May 6, 1935. 461,220.

MANUFACTURE OF DIAZONIUM SALTS.—Soc. of Chemical Industry in Basle. April 2, 1935. 461,051.

MANUFACTURE OF AROMATIC SULPHOCARBOXYLIC ACID-AMIDES and imides.—Soc. of Chemical Industry in Basle. April 27, 1935. 461,054.

COMPOSITIONS SUITABLE FOR USE IN THE WASHING OF TEXTILE MATERIALS or for other washing purposes.—R. H. Marriott, B. B. Dugan, and F. W. Berk and Co., Ltd. April 17, 1936. 461,221.

PROCESS FOR PURIFYING METALLIC CADMIUM.—Compagnie des Metaux D'Overpelt-Lommel et de Corphalie. March 21, 1936. 461,222.

PREPARATION OF ALUMINIUM OXIDE.—H. Lorquist. June 2, 1936. 461,059.

PROCESS OF RECOVERING ALUMINA from aluminous silicious material containing a substantial proportion of silica.—H. G. C. Fairweather. (Electric Smelting and Aluminium Co.). June 20, 1936. 461,117.

CONVEYANCE OF BOILING OR GASEOUS LIQUIDS.—P. Dmitrevskij. June 20, 1936. 461,227.

SILENCERS FOR SILENCING GASEOUS CURRENTS.—Maschinenfabrik Augsburg-Nurnberg, A.-G. July 22, 1935. 461,065.

LACQUERS.—Roxalin Flexible Lacquer Co., Inc. Nov. 21, 1934. 461,173.

MANUFACTURE OF THERMOPLASTIC MOULDING COMPOSITIONS and articles made therefrom.—E. R. Dillehay. June 4, 1935. 461,175.

PRODUCTION OF FISH MEAL AND OIL.—L. T. Hopkinson. May 10, 1935. 461,343.

CARBOXYLIC ACID AMIDES derived from aza compounds.—Coutts and Co., and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). June 11, 1935. 461,425.

MANUFACTURE AND PRODUCTION OF HYDROXYALKYLAMINO ANTHRAQUINONES.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 8, 1935. 461,426.

MANUFACTURE AND PRODUCTION of N-substituted derivatives of 1.4-diaminoanthraquinone.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 8, 1935. 461,427.

MANUFACTURE AND PRODUCTION of N-substitution products of 1.4-diaminoanthraquinones.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 9, 1935. 461,428.

MANUFACTURE AND PRODUCTION of water-soluble leuco compounds.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 10, 1935. 461,430.

MANUFACTURE OF CONDENSATION PRODUCTS and of lacquers and plastic masses therefrom.—W. W. Groves (Deutschen Celluloid-Fabrik). July 11, 1935. 461,352.
MANUFACTURE OF ARTIFICIAL MASSES.—W. W. Groves (Deutschen Celluloid-Fabrik). July 11, 1935. 461,495.
MANUFACTURE AND PRODUCTION of valuable polymerisation products.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 15, 1935. 461,354.

Applications for Patents

MANUFACTURE OF TANNING-AGENTS.—I. G. Farbenindustrie. (Germany, Feb. 14, '36.) 4463.
APPARATUS FOR CLASSIFICATION OF MATERIALS.—Imperial Chemical Industries, Ltd. 4549.
FUNGICIDES.—Imperial Chemical Industries, Ltd., A. D'Amico, and J. Chapman. 4685.
MANUFACTURE OF RESINS.—G. W. Johnson (I. G. Farbenindustrie.) 4340.
MANUFACTURE, ETC. OF DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) 4502.
GAS PURIFIERS.—A. Klönne (firm of), A. Klönne, and M. Klönne. (Germany, Sept. 19, '36.) 4390.
GAS PURIFIERS.—A. Klönne (firm of). (Germany, Dec. 24, '36.) 4499.
MOULDING OF POWDERED HORN.—M. Kraus. (Czecho-Slovakia, Feb. 11, '36.) 4087.
SATURATION OF LIQUIDS with gases.—S. Mahmoud-Bey. 4816.
CHEMICAL MANUFACTURE.—Mathieson Alkali Works. (United States, Feb. 24, '36.) 4473.
CHEMICAL MANUFACTURE.—Mathieson Alkali Works. (United States, Aug. 26, '36.) (Cognate with 4473.) 4474.
CHEMICAL MANUFACTURE.—Mathieson Alkali Works. (United States, Sept. 1, '36.) (Cognate with 4473.) 4475.
CHEMICAL MANUFACTURE.—Mathieson Alkali Works. (United States, Dec. 29, '36.) (Cognate with 4473.) 4476.
THERAPEUTIC COMPOUNDS.—Naamlooze Vennootschap Organon tot Bereiding van Orgaanpreparaten op Wetenschappelijken Grondslag. (Holland, Feb. 13, '36.) 4310.
DEGRADING CRUDE PHOSPHATES.—Neunkircker Eisenwerk A.-G. vorm. Geb. Stumm. (Germany, Feb. 17, '36.) 4832.
METAL CONTAINERS.—New Croydon Rubber Co., Ltd. 4211.
REFINING SUGAR SOLUTIONS.—J. E. Pollak (International Patents Development Co.). 4276.
PRODUCTION OF PLASTIC, ETC. MATERIALS.—J. E. Pollak (International Patents Development Co.). 4293.
TREATMENT OF UNBLEACHED, ETC. CELLULOSE PULPS.—U. Pomilio. (France, Feb. 13, '36.) 4550.
TREATING MEDICAMENTS.—H. Remmler, A.-G. (Germany, June 17, '36.) 4539.
APPARATUS FOR SATURATION OF LIQUIDS BY GAS.—R. E. Roth. (France, May 22, '36.) 4311.
REMOVAL OF SULPHUR COMPOUNDS, ETC. FROM COAL-GAS.—Woodall-Duckham (1920), Ltd., and E. W. Smith. 4073.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Malta.—A firm of agents at Malta desires to establish business relations with United Kingdom producers of soya bean oil and laundry soap. (Ref. No. 798.)

Belgium.—A wholesale and retail druggist of French nationality established at Verviers wishes to obtain the representation (on a commission or direct purchase basis) of United Kingdom manufacturers of cattle foods and medicines, including oil cake and crude cod-liver oil. (Ref. No. 802.)

Norway.—An agent established at Berger wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of iron oxide for paint manufacture. (Ref. No. 805.)

British East Africa.—The Crown Agents for the Colonies, 4 Millbank, London, S.W.1, report that the Kenya and Uganda Railways and Harbours are inviting tenders for the supply of petrol and kerosene for a period of twelve months from July 1, 1937, to June 30, 1938. The approximate monthly requirements are: Petrol, 7,100 gal.; kerosene (lighting), 3,800 gal.; kerosene (power), 500 gal. Tenders due noon on May 15, 1937. Tenders should be delivered at the office of the Crown Agents for the Colonies (from whom tenders form, specifications, etc., can be obtained), not later than the time specified (by hand or by post) in envelopes conspicuously marked "K.U.R. 103, Petrol and Kerosene Tender."

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